—THE—

COAL FIELDS AND COAL TRADE

OF THE ISLAND OF

CAPE BRETON,

By RICHARD BROWN, F G. S. &c.

—Author of—

—A History of the Island of Cape Breton.—

Also, from various sources, short sketches of
COAL MINING IN
Pictou and Cumberland Counties,
AND OF THE
MINERALS OF NOVA SCOTIA.

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PREFACE.

It being almost impossible, of late years to procure, at any price, a copy of Mr. Richard Brown's work on The Coal Fields and Coal Trade of Cape Breton, a desire was expressed that the book be reprinted. The issue of the work in its present form is in response to that request.

Though geologists have been making researches during the past thirty years, the general accuracy of Mr. Brown's work remains unchallenged. Indeed Mr. Brown's work is still the best, if it may not be said the only authority on the subject he treats.

In addition, as an appendix, is given a short history of coal mining in Cumberland and Pictou Counties, and also a sketch of the minerals common to Nova Scotia.

The compiler of these sketches is indebted to several friends, particularly Dr. Gilpin, of the Mines office, for notes and hints.

The maps which formed so useful an adjunct to the original issue of Mr. Brown's work, do not appear in the reprint, as the book is to be sold at a price forbidding large expenditures on plates etc.

R. DRUMMOND.

THE COAL-FIELDS AND COAL TRADE

—OF—

CAPE BRETON.

CHAPTER I.

THE CARBONIFEROUS SYSTEM OF CAPE BRETON.

It will be seen, by a glance at the geological map that the rocks of the carboniferous system cover about one half of the whole area of the island; the other half being, so far as now known, occupied by igneous, metamorphic, and silurian rocks. The prevailing igneous rock is a red syenite which occurs in long narrow ridges of considerable elevation, running in a north-east and south-west direction. Granite, porphyry, and trap are sometimes met with, but only in patches of small extent. Stratified gneiss, mica slate, clay slate, and upper silurian rocks, often highly metamorphosed and disturbed, succeed the igneous rocks, and are in turn overlaid by the conglomerate which generally forms the basis of the carboniferous system. In some instances, however, the conglomerate is wanting, and the carboniferous limestone rests upon silurian or metamorphic rocks, and occasionally even upon those of igneous origin.* For an accurate account of the geological structure of the island, the reader is referred to Doctor Dawson's excellent and well-known work on Acadian Geology,[*] the object of the present work being confined to a description of the coal formation, and the history of the rise and progress of the coal trade of the island.

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* A well-defined example occurs on the north side of the Great Bras d'Or, where the limestone lies upon syenite at the northern, and upon quartzite at the southern end of the district—localities only two miles apart.

The carboniferous system of Cape Breton, comprises four distinct formations, each of great but variable thickness: namely, the conglomerate (1), the carboniferous limestone (2), the millstone grit (3), and the productive coal-measures (4).

The Conglomerate, the basis of the carboniferous system—analogous in mineralogical character and position to the old red sandstone of Great Britain—is composed of waterworn pebbles and angular fragments, derived from the neighbouring hills, of metamorphic and igneous rocks, which appear to have accumulated under cliffs bordering on the shores of an ancient sea—a process still going on in the formation of shingle beaches by the wasting of adjacent hills and precipices. The pebbles consist of pieces of syenite, gneiss, mica slate, quartzite, flinty slate, hard sandstone, and occasionally a dark-gray limestone, cemented together by a red ferruginous paste.[†] The conglomerate is very irregular in thickness, sometimes forming hills five to eight hundred feet in height, at others, beds merely a few feet in thickness, and in some instances being altogether wanting. At McMillan's Point, in the Gut of Canceau, a well-defined anticlinal axis occurs in the conglomerate, the strata on one side dipping northerly towards Port Hood, on the other southerly under the Richmond coal-field. In the Isle Madame it rests upon the upper silurian rocks of Arichat and under-lies the limestone and gypsum of Lennox's Passage. It is seen cropping out at various places on the north-west or Gulf shore between Mabou and Cheticamp, rising to a considerable height on the flanks of the syenitic hills. Between Margarie and Whykokomagh it constitutes a lofty range of hills, which form striking objects in the wild and picturesque gorge traversed by the road between those two settlements; and at Baddeck, the Great Narrows, and many other places, the rugged hills of conglomerate form the most conspicuous features in the beautiful scenery of the Bras d'Or Lakes. In connection with the Sydney coal-field it is found only in thin beds at Kelly's Cove, George's River, the head of the north-west arm of Sydney Harbour, and on the south shore of Mira Bay. It does not furnish any materials adapted for industrial purposes. No fossils have been found in the conglomerate except a few *fish scales* and fragments of *Calamites* in some thin slaty sandstones interstratified with it, on the north shore of St. Anne's Harbour.

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[*] *Acadian Geology.* By J. W. Dawson, LL.D., &c. Second edition. Macmillan & Co., London. 1868.

[†] A detailed section of the carboniferous limestone, with its associated beds of gypsum and marl, at this locality, will be found in a paper by the writer in the *Quarterly Journal of the Geological Society*, vol. iii. p. 257, Dr. Dawson says, 'This section did good service in confirming the new and more accurate views of the structure of the carboniferous rocks in Nova Scotia, *promulgated by Sir Charles Lyell in* 1842.

The Carboniferous Limestone, including its associated beds of *Shale*, *Marl*, and *Gypsum*, spreads over nearly one-seventh of the whole surface of the island, and probably extends under the great area occupied by the waters of the Bras d'Or Lakes. This formation consists of thick beds of red and gray shale, red marl, sandstone, limestone, and gypsum. The beds of gypsum—a distinctive feature in the series—in some places have a thickness of more than 200 feet, forming lofty precipices in the interior, and continuous cliffs of great extent on the shores of the Bras d'Or Lakes and St. Anne's Harbour. On the sea-coast it is largely developed in Lennox's Passage, the Gut of Canceau, on the Gulf shore, and at Aspey Bay near Cape North. The limestone beds, both laminated and concretionary, contain marine fossils characteristic of the same formation in Europe, chiefly of the genera *Productus. Terebratula, Spirifer, Modiola, Crinoidea Euomphalus. Conularia.* &c. In some localities the thickness of the formation probably exceeds 2,000 feet; but in many places it is much less, as, for instance, at Cape Dauphin, where it occurs in a highly inclined position resting upon syenite, its thickness, in a very clear section, is only 850 feet.* The limestones of this formation are well adapted for agricultural and building purposes, and in some places, in the vicinity of igneous rocks, furnish white, gray, and variegated marble, of good quality, in great abundance. Gypsum occurs in many situations convenient for shipment to the United States, where it is in great demand for agricultural purposes ; but very little is exported from Cape Breton, the extensive quarries on the Bay of Fundy † being able to supply all that is required at a much lower rate of freight. Brine springs issue from the lower beds of the carboniferous limestone at Baddeck, St. Patrick's Channel, and Waykokomagh, which at some future day will supply the fisheries with common salt, and provide a market for the small coal now unsaleable at some of the mines. Petroleum springs also are said to have been recently discovered on the shores of Lake Ainslie, in the shales of the carboniferous limestone formation.

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* The export of gypsum from Windsor, Nova Scotia, to the United States, exceeds 120,000 tons annually.

The Millstone Grit. The great sandstone formation resting upon the carboniferous limestone, which, for the sake of brevity, we may designate the Millstone Grit—the name given to its equivalent in the English coal-fields—consists of a series of coarse and fine grained sandstone beds, with a few layers of shale at wide intervals, and, in one or two instances, thin seams of coal. Fragments of fossil plants of the genera *Sigillaria, Lepidodendron* and *Calamites*, occur in some of the beds, in tangled masses, apparently collected together by currents or eddies. Its thickness is very irregular. On the shores of Sydney Harbour it probably exceeds 1,800 feet ; but at Cape Dauphin, the western extremity of the coal-field, its thickness is only 200 feet. In the county of Richmond it attains also a considerable thickness, covering a large tract of country between the river inhabitants and St. Peters. Between Port Hood and Margarie, on the Gulf shore, the millstone grit is confined within narrow limits, occupying a belt of country running parallel to, and overlying, the carboniferous limestone. In the Sydney district it can be traced, almost without interruption, from Mira Bay to Cape Dauphin, varying from one to three miles in width. The Bird Islands, each about three-quarters of a mile in length—outliers of this formation—were evidently once connected with the millstone grit of Cape Dauphin. As the limits of the coal-measures can always be determined by the outcrop of the higher beds of the millstone grit, it is fortunate that its existence, though concealed by the soil, may almost every where be detected by the presence of large angular weather-worn blocks of sandstone, thickly spread over the surface of the country. These blocks, which are sometimes of great size, are identical in mineralogical character with the beds of millstone grit upon which they lie, and seem to have been detached by means of frost or ice. They clearly have not been brought from a distance as they are in no instances rounded or boulder-shaped, but, on the contrary, rhomboidal or tabular, their sharp corners only being worn off by long exposure to atmospheric influences. Neither can they have been, in geological time, old occupants of their present position, as they would have been crushed or carried away by the icebergs or glaciers which have left evident marks of their former presence in the grooves, and scratches on the outcropping sandstones of the coal-measures in their immediate vicinity. By the aid of these blocks, the southern limit of the coal-measures may be traced from the Great Entrance across the island of Boulardrie to the Little Entrance of the Bras d'Or, and thence to the western shore of Sydney Harbour. Crossing the harbour, they may be traced from the South Bar, where the millstone grit presents an escarpment of considerable elevation, to Hardwood Hill, behind the town of Sydney. They appear again at the mouth of Mira River, but have not been observed between that river and the last-named locality. Although the sandstones of the millstone grit are generally coarse and pebbly, and often false bedded, quarries of excellent building-stone are worked in many localities; and, in the vicinity of the Sydney mines and also near the South Bar, there are quarries of superior flags and grindstones.

At Stubbert's Point, on the north side of Sydney Harbour, where the coal-measures rest conformably upon the millstone grit, the latter dips to the north-east at an angle ot six degrees; but at McPhee's Ferry, on the south side of the harbour, it dips due north at an angle of thirty degrees near its junction with the coal-measures; and south-easterly at the South Bar, two miles further up the harbour. These great disturbances are due, probably, in the first case, to a fault running up the harbour; and in the second, to an anticlinal fault running from the north shore of Lingan Bay (which will be described in a future page) to the South Bar, and thence to Point Edward, where the upper beds of the carboniferous limestone are disturbed in the same manner.

The Coal-measures—the most important member of the carboniferous system, resting upon the millstone grit—consist of a great accumulation of sedimentary strata of *shale*, *sandstone*, and *fireclay*, containing valuable seams of bituminous coal. The *shales*, which were once fine mud, constitute, in thickness, nearly two-thirds of the whole formation. They are generally argillaceous and arenaceous, but in some cases carbonaceous and bituminous. The first are of a gray or bluish-gray colour but occasionally tinged red by the peroxide of iron. They are the great depositaries of the *fossil plants* peculiar to the coal formation of Great Britain and other countries. The great abundance and variety of fossil plants in the Sydney coal-field are very striking, one section of 1,860 feet in thickness having afforded more than a hundred characteristic species, nine-tenths of which were collected from the bed of shale forming the roof of the main coal-seam. In addition to these, twenty-one new species have been discovered by the writer in the same locality.[*] Erect trees, some of large size, occur at eighteen different levels in the same section, belonging to the genera *Sigillaria*, *Lepidodendron*, and *Calamites*.[†] Roots and rootlets of *Stigmaria* occur in great abundance in the beds of fireclay, or underclay, which form the floors of all the coal-seams; frequently also in beds of shale, overlying coal-seams, attached to the stumps of erect trees.[††] *Ripple marks*, *sun cracks* and *worm tracks* are of frequent occurrence in the shales, and, occasionally, impressions of *rain drops*; a specimen of the last, found by the writer, is said by Dr. Dawson 'to have afforded the finest example yet known of carboniferous rain marks.'[¶]

The *sandstone* beds, which once were loose sand,

[*] The reader is referred to Dr. Dawson's *Acadian Geology* for a list of the Sydney coal-plants, and descriptions of the new species.

[†] For descriptions of these see papers by the writer in the *Quarterly Journal of the Geological Society*, vol. ii. p. 96; and vol. v. p. 354.

[††] A fine specimen of a compressed Sigillaria stump, the '*dome shaped fossil*,' which so long puzzled fossil botanists, from the Sydney coal-measures, may be seen in the Museum of Geology, Jermyn Street. 'Mr. Brown's various papers on these fossils gave to the geological world the first really satisfactory information respecting the true nature and growth of *Stigmaria*. Mr. Binney can claim priority in date of publication, but his specimens were much less perfect in details of structure, and therefore less satisfactory than those described by Mr. Brown.'—*Acadian Geology*, p. 406.

[¶] *Acadian Geology*, p. 410.

are generally of considerable thickness, mostly coarse-grained, rarely pebbly. False bedding is very frequent. Whilst the *shales*, as proved by the manner in which the most delicate and fragile ferns are preserved, were evidently deposited in quiet shallow waters; the sand stones, on the contrary, except in a few instances, accumulated under conditions of an opposite character. Sigillariae, Calamites and Lepidondendra are common in some of the beds of coarse sandstone, but almost always in short fragments or tangled bunches, showing that they have been drifted from a distance and deposited from troubled waters. Some of the sandstones are in thin layers and flaggy. At Lloyd's Cove, near the Sydney mines, *rill marks*, formed by receding wavelets, are abundant in a flaggy brown sandstone, which has also furnished a fine example of the *footprints* of a land animal, plainly proving that it was deposited upon a flat tidal sandy shore.* With the exception of these footprints, no animal remains have been found in the shales and sandstones above described; they are, however, very abundant in the bituminous shales and some thin layers of limestone, consisting of *Modiola*, *Microconchus*, *Spirorbis*, *Unio*, *Cypris*, &c. *Scales, teeth, and spines of fishes* of the genera *Holoptychius*, *Palaeoniscus*, *Gyrolepis*, and *Amblypterus*, are found in the same beds, together with *Coprolites*.

It will be observed, by reference to the geological map, that there are six separate portions of coal-measures distinguished by a dark shading, each of which, at first sight, might be supposed to represent a distinct coal-field; there are, however, only three—the Sydney, the Inverness, and the Richmond coal-fields; the four small patches of coal-measures at Port Hood, Mabou, Broad Cove, and Chimney Corner being portions of one great coal-field extending under the waters of the Gulf of St. Lawrence. A description of these coal-fields will form the subject of the following chapter.

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* These footprints are described by Dr. Dawson in the *Canadian Naturalist*, under the name of *Sauropus sydnensis*. There is a sketch of them in his *Acadian Geology*, p. 358, and of the rill marks in the same work at p. 27.

CHAPTER II.

THE SYDNEY COAL-FIELD.

The coal-field of Sydney—the most extensive, and, it may safely be asserted, the most valuable in the province of Nova Scotia—extends from Mira Bay on the east to Cape Dauphin on the west, a distance of thirty-one miles, being bounded on the north by the sea-coast, and on the south by the millstone grit formation. This tract of country, occupying an area of about 200 square miles, is intersected or indented by several bays and harbours affording exposed sections of the coal-measures in the cliffs, which, with the exception of a few sand beaches, extend along the whole coast from Mira Bay to Cape Dauphin. From these cliffs, varying from twenty to one hundred feet in height, the land rises gradually towards the interior, rarely attaining a greater elevation than 150 feet at a distance of one mile from the shore. Viewed from the sea, the general aspect of the country is undulating, low valleys proceeding inland from the bays and harbours, separated by gently swelling wooded hills, terminating in headlands on the sea-coast. There can be no doubt that at no far distant day (in geological time) the coal country extended far to the north-eastward, and occupied a considerable area now covered by the sea, as the scarped rocky cliffs, composed of alternate beds of sandstone and shale, present a feeble bulwark against the incessant attacks of the waves of the Atlantic. When the island last emerged from the sea, a low gravelly beach—not a cliff—naturally constituted its coast-line; this beach, exposed to the abrading action of the surf, soon gave place to an incipient cliff, which has been gradually, but steadily, receding inland from that time up to the present day.* If not arrested in its

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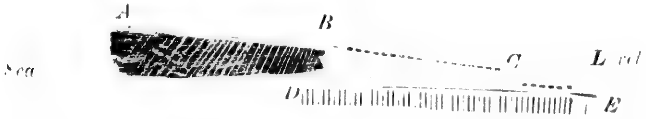
* That such was the fact is evident from a careful inspection of the contour of the land, which generally presents a gently sloping surface towards the sea coast, as shown in the annexed diagram.



where A. B. represents the slope of the land terminating at the cliff B, and D. E. the present sea bottom. The line A. B. continued at the same angle of declination, strikes the sea level at C the situation progress by artificial means, in the course of time the whole of the coal lands will become the prey of the restless ocean. In some cases this wasting of the land must have proceeded at a more rapid rate than that mentioned in the foot-note, owing to land-slips under peculiar conditions, as for instance at Cranberry Head, where, some years ago, a mass of strata twenty yards square and fifteen yards in perpendicular height, overlying a thin seam of coal resting upon an underclay floor, slipped off at once, forming a small island, detached about twenty feet from the mainland. The effects of a similar landslip on a much larger scale, may still be seen between Low Point lighthouse and the Barrasois, where a mass of strata half a mile in length, 200 yards in width, and twenty yards in height, resting upon a seam of coal. having a strike parallel with the coast-line, has slipped down bodily, owing to the softening of the underclay, on one side by land-springs and rains, and on the other by the action of the surf. The debris of the fallen mass at the foot of the cliff, before this time, has probably been ground into mud and sand by the waves, but the course of the land-slip may be distinctly traced from end to end by means of the long rugged gaps and holes left on the surface of the land.

The total thickness of the Sydney coal-measures has not yet been correctly made out, but there is good reason to conclude that, from Burnt Head near Glace Bay, where the highest known bed occurs, down to the millstone grit, it is not much under 7,000 feet[†]. On

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of the ancient beach when the land was last elevated into its present position. Applying this theory to several localities on the coast where the heights of the cliffs and the slope of the adjacent land are known, it appears that a belt of land two miles in width, between the present and the ancient coast lines has been removed. The writer, from observations extending over a period of thirty years, having ascertained that the wearing away of the cliff at one locality averaged five inches per annum, it follows that more than 25,000 years have passed away since the coal country emerged from beneath the waters of the Atlantic.

[†] In a paper published in the *Quarterly Journal of the Geological Society*, vol. vi. p. 115. the writer stated that the thickness of the *productive* coal-measures probably exceeded 10,000 feet. He has since found, upon revising his estimate, that, in placing the thickness of the Boulardrie section at 5,400 feet, the millstone grit and carboniferous limestone, together 2,800 feet in thickness, were erroneously included in this amount. Deducting this grave error, the thickness of the *productive* coal-measures will not much exceed 6,000 feet. The explorations in progress in the Glace Bay district will soon it is hoped, accurately determine their thickness.

this important question the reader will be better prepared to form an opinion for himself when he has perused the following account of the position and extent of the several seams in both divisions of the coal field. As the line of separation of the coal-measures from the millstone grit has not yet been correctly ascertained between Mira Bay and Sydney Harbour, it will be better first to describe the western portion of the coal-field, where the coal-measures can be distinctly seen resting upon the millstone grit, without interruption, from Stubbert's Point to Cape Dauphin. This will give us a well-defined starting-point from the lowest beds, and enable us subsequently to trace, more satisfactorily, the connection of the seams in the eastern and western divisions of the coal-field.

The Sydney Mines district, lying between Sydney Harbour and the Little Entrance of the Bras d'Or Lakes, occupies an area of about ten square miles. Partial sections of the coal-measures are visible at many places in the interior and on the borders of the district, but nowhere in such perfection as in the cliffs on the north-west shore of Sydney Harbour, which exhibit a complete section, directly at right angles to the line of strike, three miles in length and 1,860 feet in depth, extending from Cranberry Head, at the entrance of the harbour, to Stubbert's Point, where the lowest bed of the coal-measures may be seen lying comformably upon the millstone grit.

The following is a section of the coal-measures from Cranberry Head to Stubbert's Point, in desending order, showing, in separate columns, the thickness of each seam and of the intervening strata of sandstone, shale, underclay, &c. in the Sydney Mines district*:—

				Ft.	In.	Ft.	In
Strata				21	7	...	
Coal (Cranberry Head Upper Seam)				...		3	8
Strata				15	8	...	
Coal	0	2	(Cranberry Head Lower Seam)	0	2	0	10
Clay	0	2					
Coal	0	8					
Strata				245	8	...	
Coal	0	2		0	8	0	5
Soft Shale	0	8					
Coal	0	3					

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* Compiled from a detailed section taken by the writer, published in the *Quarterly Journal of the Geological Society*, vol. vi. p. 115.

Brought forward				Ft.	In.	Ft.	In.
Strata				17	3	...	
Coal	2	0	(Lloyd's Cove Seam)	0	3	6	0
Clay	0	2					
Coal	0	6					
Clay	0	1					
Coal	3	6					
Strata*				250	3	...	
Coal	0	7	(Chapel Point Upper Seam)	0	5	0	11
Clay	0	5					
Coal	0	4					
Strata				106	11	...	
Coal	1	1	(Chapel Point Lower Seam)	2	9	2	1
Clay	0	4					
Coal	0	5					
Fireclay	2	5					
Coal	0	4					
Strata				21	6	...	
Coal				...		0	3
Strata				162	8	...	
Coal				...		0	4
Strata				178	9	...	
Coal (The Sydney Main Seam)				...		6	0
Strata				43	1	...	
Strata				12	1	...	
Coal				...		0	4
Coal				...		0	9
Strata				130	11	...	
Coal	0	2	(Quarry Seam)	0	3	0	8
Carboniferous Shale	0	1					
Coal	0	3					
Carboniferous Shale	0	2					
Coal	0	3					
Strata				76	9	...	
Coal				...		0	4
Strata				46	0	...	
Coal	0	5		0	2	0	6
Carboniferous Shale	0	2					
Coal	0	1					
Strata				26	10	..	
Coal				..		1	3
Strata				120	4	..	
Coal	0	8	(Indian Cove Seam)	0	1	4	8
Shale	0	1					
Coal	4	0					
Strata				61	9	..	
Coal				..		0	11
Strata				21	11	..	
Coal				..		1	4
Strata				20	10	..	
Coal				..		0	7
Strata				8	11	..	

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* About 144 feet of these beds are concealed by the sand beach of Lloyd's Cove, but can be distinctly seen on the sea-shore between Cranberry Head and Black Point on their line of strike.

Brought forward				Ft.	In.	Ft.	In.
Coal				..		0	2
Strata				73	9	..	
Coal	0	1	(Stony Seam)	2	10	3	0
Shale	0	3					
Coal	0	2					
Shale	0	2					
Coal	0	2					
Fireclay	1	10					
Coal	1	2					
Carboniferous Shale	0	2					
Clay	0	2					
Coal	1	3					
Carboniferous Shale	0	3					
Coal	0	2					
Strata				1	10		
Coal	0	2	(Shelly Seam)	0	7	0	5
Shale	0	1					
Coal	0	1					
Carboniferous Shale	0	6					
Coal	0	2					
Strata				65	2	..	
Coal				..		1	0
Strata, with traces of Coal in three places				72	5	..	
				1,823	9	36	3
Coal				36	8		
Total Thickness				1,860	0		

It will be seen by this table that, although there are not less than thirty-six beds and layers of coal in the section, only four are of sufficient thickness to be economically worked, namely, the Cranberry Head, the Lloyd's Cove, the Main, and the Indian Cove seams, whose aggregate thickness is twenty feet four inches.

All the principal seams of this district, except that at Cranberry Head, which runs into the sea, can be traced across the country from Sydney Harbour to the Little Entrance of the Bras d'Or Lakes. The Lloyd's Cove seam certainly is not quite continuous, as it crops out on the coast a quarter of a mile to the westward of Cranberry Head, and runs into the sea, but owing to an undulation in the measures at right angles with the strike, the seam is deflected to the west, and rising out of the sea, again appears above high-water mark near Bonar's Head, from whence it has been traced running nearly due north to Plant's Point. It maintains a tolerably uniform section until it nearly reaches Plant's Point, when, owing to a rapid increase in the thickness of the clay parting it is split into two distinct beds, separated by fifteen feet of shale.

The two beds forming the lower seam at Chapel Point, sixteen and four inches thick, were both met with in sinking the Queen Pit three-fourths of a mile to the westward. They are visible in the cliff at Black Point, and also at Oxford Point. At the latter place the upper seam is four, and the lower two feet six inches in thickness, separated by eighteen feet of shale. They have not been traced any further to the northward.

The 'Six-Foot,' or main seam, maintains its full thickness as far as the Big Pond, gradually bending round to the northward as it approaches the undulation in the measures in that locality. It has been traced, by means of boring and sinking, from Cox Hill on the north side of the Big Pond, as far as Kidd's Point on the Little Entrance of the Bras d'Or, a distance of three miles, but between those two places its thickness nowhere exceeds four feet ; at Kidd's Point it is only three feet six inches. The quality of coal, however, shows no signs of deterioration.

The Indian Cove seam has been worked at a pit one mile to the westward of Indian Cove, and at a place about a mile further in the same direction. It has also been proved at a trial pit and boring near the Little Entrance. There is little variation in thickness at all these places. Its roof of bituminous shale, containing 'modiolœ' 'cyprides,' 'fish scales,' &c., clearly establishes its identity from Indian Cove to the Little Entrance. On the shore of the Little Entrance there is another bed of coal four feet ten inches in depth, lying 200 feet below the preceding, which is probably the equivalent of the stony seam of the Sydney Mines section.

The inclination or dip of all the seams is about seven degrees, but its direction gradually comes round from north-east on the shore of Sydney Harbour to nearly due east at the Little Entrance. The amount of dip has, however, been found to decrease rapidly towards the north-east in the underground workings at the Sydney Mines, where, at the distance of one mile from the outcrop of the seam, it does not exceed five degrees.

The Boulardrie District, bounded on the east and west by the Little and Great Entrances respectively, and on the south by the millstone grit, occupies an area of about eight square miles, containing several valuable seams of coal. Though separated only from the Sydney Mines district by the narrow channel of the Little Entrance, which is not more than 100 yards in width, the connection of the coal-seams on each side of this channel cannot, owing to serious disturbances caused by faults, be satisfactorily determined. On the north-west side of the island of Boulardrie, fortunately, there is less disturbance, and a continuous section is visible in the cliffs from Point Aconi to the millstone grit, a distance of about six miles, interrupted at only two or three places by low shingle beaches. The three upper seams have been clearly traced by borings and trial pits across the northern end of Boulardrie island, but those below have been seen only at certain places. There is, however, every reason to believe that they continue, without interruption, from the north-west shore in a south-easterly direction, until they reach the faults above mentioned. The relative position and thickness of the coal-seams are shown in the following section, beginning at Point Aconi in descending order:—

Strata of Sandstone and Shale				50 ft.	0 in.	ft. ..	in.
Coal (Point Aconi Seam)				..		3	6
Strata				300	0	..	
Coal	3	3	(Bonar's Seams).	11	0	7	3
Shale	14	0					
Coal	4	0					
Strata				380	0	..	
Coal	2	0					
Clay	0	1½					
Coal	0	3					
Clay	0	1½					
Coal	5	0					
Strata				280	0	..	
Coal	3	6	(Crawley's Seam).	0	6	7	6
Fire-clay	0	6					
Coal	4	0					
Strata (containing bituminous shale with Modioala, &c.)				560	0	..	
Coal	2	6	(Mill Pond Seam).	1	0	4	0
Shale	1	0					
Coal	1	6					
Strata				400	0	..	
Coal (Black Rock Seam)						4	0
Strata (resting upon the Millstone Grit)				585	0	..	
				2,567	9	33	6
Coal				33	6		
Total Thickness				2,601	3		

The general resemblance of these seams and of certain strata associated with them, both in character and relative position, to those of the Sydney Mines' section, is very striking, though there are some discrepancies, not, however, of greater importance than in many instances in other parts of the coal-field, where the identity of the beds is indisputable. It may, therefore, be safely concluded that, taking each series in descending order, those of the Boulardrie, in the first column of the following list, are the equivalents of those placed opposite to them, in the Sydney Mines' section :-

Boulardrie Section.				*Sydney Mines Section.*		ft.	in.
Pt. Aconi Seam		3 ft.	6 in	Under the Sea			
Bonar's Seam	Coal	3	0	Cranberry Head	Coal	3	8
	Shale	11	0		Strata	15	8
	Coal	4	0		Coal	0	10
Stubbert's Seam	Coal	2	0	Lloyd's Cove Seam	Coal	2	0
	Clay	0	1½		Clay	0	2
	Coal	0	3		Coal	0	6
	Clay	0	1½		Clay	0	1
	Coal	5	0		Coal	3	6
Crawley's Seam	Coal	3	6	Chapel Point* Upper Seam	Coal	0	7
	Clay	0	6		Clay	0	5
	Coal	4	0		Coal	0	4
Mill Pond Seam	Coal	2	6	Main Seam		6	0
	Shale	1	0				
	Coal	1	6				
Black Rock Seam	Coal	4	0	Indian Cove Seam	Coal	0	8
					Shale	0	1
					Coal	4	0

A very strong point in confirmation of the identity of the two series of seams is the fact that both the Black Rock and Indian Cove seams, the lowest beds in each section, have roofs of black bituminous shale, containing 'modiolæ' 'cyprides,' 'scales' and 'spines of fishes,' &c.; and further, that beds of the same kind of shale, containing fossils similar to the preceding, are found between the Chapel and the main seam in the Sydney, and the Crawley and the Mill Pond seams, in the Boulardrie section, on almost exactly the same horizon.

The average dip of the strata in the Boulardrie district is north-east at angle of six degrees. The outcrops of the seams on the Little Entrance have not been fully ascertained, although a number have been seen; their course and continuation to the northward can only be determined when the position and throw of the faults, which have caused so much disturbance in the original position of the strata, have been correctly ascertained.

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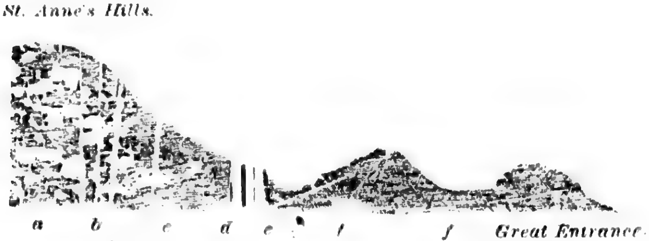
* This seam thickens as it proceeds westwards, the upper bed being four, and the lower two feet and a half, at Oxford Point, two miles west of Chapel Point.

The Cape Dauphin District, at the northwestern extremity of the Sydney coal-field, is separated from that of Boulardrie by the waters of the Great Entrance of the Bras d'Or lakes. Though occupying an area of little more than two square miles, all the formations of the carboniferous series are here found between the southern flank of the Syenitic hills of St. Anne's and the Great Entrance, perfect sections of the members of each formation being visible at Cape Dauphin and Kelly's Cove—the northern and southern ends of the district. At both of these places the strata are inclined at an angle of sixty degrees dipping to the east, but midway between them the strata are nearly vertical, being squeezed or compressed within very narrow limits at their outcrops by the upheaval of the Syenitic rocks. The coal-measures, as it is known occupy an area of one square mile, in the form of the segment of a basin or trough similar to that at Cow Bay at the eastern extremity of the coal-field. Two seams of coal, in a vertical position, have been discovered midway between Cape Dauphin and Kelly's Cove—one four, and the other six feet in thickness, separated by eighty-three feet of strata. The six-feet, which is the lowest seam, has also been discovered in a vertical position half a mile to the eastward ; and the four-feet, or upper seam, in a deep ravine half a mile to the southward, dipping easterly at an angle of twelve degrees. The position of the several members of the carboniferous series in this interesting locality is shown in the annexed section :



a Syenite.
b Carboniferous Limestone.
c Millstone Grit.
d Six Feet Seam.
e Four Feet Seam.
ff Coal Measures.

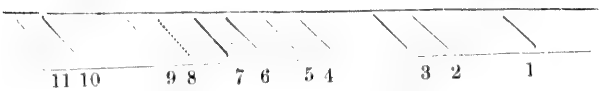
At Kelly's Cove a narrow belt of quartzite is seen in the cliff lying between the carboniferous limestone and the Syenite, but it appears to have been squeezed out before it reached the locality of the above section.

CHAPTER III.

The Glace Bay District.—As the coal-measures in the eastern division, between Mira Bay and Sydney Harbour, are most fully developed in the vicinity of Glace Bay, where they have been carefully surveyed by Professor Lesley and other skilful geologists, it will be best to describe them in the first instance; we shall then be better prepared, taking the Glace Bay series as a starting-point, to define the mutual relations and establish the identity of the seams in the adjoining districts. The coal seams are disposed in the form of an elliptical basin or trough, of which the longitudinal axis runs in a nearly due east and west direction from Table Head towards the town of Sydney. By far the greatest portion of this basin lies under the sea; the western end only—extending from the coast to the millstone grit, being available for mining purposes, though workings may at a future day be continued some distance under the sea.* This contingency, however, is not likely to occur very shortly, as the coal measures of the Glace Bay basin, bounded on the east and west by the sea coast and the millstone grit, and on the north and south by the anticlinals of Lingan and Cow Bay, underlie a land area of at least sixty square miles. The courses of these anticlinals will be pointed out at a subsequent page.

The Hub seam, the highest in the series, is followed in succession by the Harbour, Three Foot, Back Pit, Phelan, and several other seams, as shown in the annexed diagram. This section, with the aid of the table which follows, will, it is hoped, give a correct idea of the relative position of the seams in the series:—

Section of Glace Bay Basin.



1. Hub Seam.
2. Harbour Seam.
3. Three Foot Seam
4. Back Pit "
5. Phelan "
6. Spencer or Ross Seam.
7. McRury Seam.
8. Lorway? "
9. Gardener "
10. Two Feet "
11. Martin's "

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* Mr. Hull, the director of the Geological Survey of Ireland, in his work on the coal-fields of Great Britain, estimates that coal-min-

Beginning at Table Head on the sea shore, we have, in descending order :—

				Ft.	In.	Ft.	In.
Strata of Sandstone, Shale &c				240	0	..	
Coarse Coal	1	2	(Hub Seam)	0	1	9	8
Good Coal	5	6					
Shale Band	0	1					
Good Coal	3	0					
Strata				520	0	..	
Coarse Coal	0	3	(Harbour Seam)	...		5	0
Good Coal	4	9					
Strata				243	0	..	
Coal (Three foot Seam)				..		3	0
Strata				54	0	..	
Coal	1	4	(Back Pit Seam)	0	3	4	6
Black Shale	0	2					
Coal	0	8					
Clay	0	1					
Coal	2	6					
Strata				104	0	..	
Coal (Phelan Seam)				..		8	3
Strata				135	0	..	
Coal (Spencer or Ross Seam)				..		5	0
Strata				90	0	..	
Coal (McRury Seam)				..		2	8
Strata				400	0	..	
Coal (Lorway Seam)				..		4	6
Strata				260	0	..	
Coal (GardenerSeam)				..		4	9
Strata				460	0	..	
Coal (Not named)				..		2	0
Strata				250	0	.	
Coal (Martin's Seam)				...		2	0
				2,756	4	51	4
			Coal	51	4		
			Total Thickness	2,807	8		

The Tracey seam of the Cow Bay district is said to lie 2,400 feet below the McRury seam, but it is not marked in the section or table, as it has not yet been found on the south side of Lingan Bay. For the same reason, the Lorway seam is marked in broken lines in the section, as it has only been proved about a mile to the southward of the line of section, and may possibly be a continuation of the Gardener seam.

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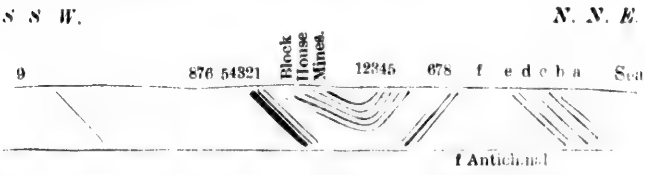
ing may be carried on at a perpendicular depth of 4,000 feet. If this be correct, taking the dip of the Glace Bay seams at an angle of five degrees, workings may be continued, from a seam cropping out on the shore, four miles under the sea.

The Hub and Harbour seams are confined to the promontory bounded by the shores of Glace Bay and Indian Bay, where they run under the sea and do not reappear. All the others, down to the McRury seam inclusive, continue to the eastward as far as the north head of Cow Bay, where they also run under the sea. It is probable, however, that a three-feet seam, which crops out on Flint Island, a mile and a half to the eastward of Cow Bay Head, is a continuation of one of those seams, and that the island was at one time part of the adjacent mainland. Neither Martin's nor the two-feet seam above it have yet been traced beyond the places where they were first discovered. Many of the seams vary considerably in thickness in their course from Indian Bay to Schooner Pond; the most remarkable instances, together with some other peculiarities, will be noticed in a future chapter, when the workings opened in them come under consideration. The direction of the dip of the several seams in the Glace Bay basin of course varies as they proceed along their curved lines of strike, from north-east on the eastern to east on the northern side of the basin, the angle of inclination rarely exceeding five degrees.

The Cow Bay Basin is seperated from that of Glace Bay by an anticlinal axis, formed by an undulation in the coal measures, running in a westerly direction from the north end of Long Beach to its termination at a point, three miles to the westward of Sand Lake, where it runs out. Its course is indicated by the opposite dips of the strata on its north and south sides, and, occasionally, by blocks of weatherworn sandstone scattered along the surface, which have, apparently, been detached from a thick bed of that material cropping out at Long Beach and along the line of the undulation or upheaval of the strata.



The diagram shows the position of the seams of the Cow Bay basin, and their seperation from their equiva-

COW BAY SEAMS.	GLACE BAY SEAMS
1. 1. Block House Seam.	a. Three Feet Seam
2. 2. McAulay "	b. Black Pit "
3. 3. Spencer "	c. Phelan "
4. 4. McRury "	d. Spencer or Ross Seam
5. 5. Three Feet "	e. McRury "
6. 6. } Long Beach Seams.	
7. 7. }	
8. 8. }	

lents of the Glace Bay basin on the opposite side of the anticlinal.

In making a traverse from the sea coast along the line of Section No. 2, the McRury seam of the Cow Bay basin is the lowest that is met with to the northward of the anticlinal ridge. The greater portion of the Cow Bay basin passes under the waters of the bay, not more than 200 acres of the Block-house seam—the best in the series, being available for mining purposes. The following table shows the thickness and relative position of the Cow Bay seams, commencing in the centre of the basin at the Block-house mines, and descending towards the anticlinal:

Strata of Sandstone and Shale				200ft.	0 in.		
Top Coal	1	0	(Block-house Seam)				
Coal	8	0				9	0
Strata				350	0	..	
Coal	2	2	(McAulay Seam				
Clay	0	1					
Coal	2	8		0	1	4	10
Strata				200	0	..	
Coal (Spencer Seam—the Ross Seam of Glace Bay)				..		2	8
Strata				50	0	..	
Coal (McRury Seam)				..		4	4
Strata				100	0	...	
Coal (Three Feet Seam)				..		3	0
Strata				200	0	..	
Coal				..		1	6
Strata				100	0	...	
Coal (Long Beach Seam)				..		3	2
				1,200	1	28	6
Coal.				28	6		
Total Thickness				1,228	7		

Proceeding southerly from the centre of the basin on the same line of section, a similar series of strata is met with, dipping, of course, in the opposite direction. Three miles further to the southward, a five-feet bed of coal, named the Tracey Seam, crops out on the north shore of Mira Bay, which is said to lie at a depth of 2,400 feet below the 'Three-Feet' seam in the above section.

On the southern shore of Cow Bay there are several seams, or rather groups of seams, in the cliffs, running across the narrow promontory called the South Head. They are supposed to be continuations of some of the beds on the south side of the Cow Bay basin, but they bear such a slight resemblance, in stratigraphical features, to any of those beds, that it is hard to believe they can really be identical. Passing into the sea on the south side of the headland, all further traces of them are lost, as the space once occupied by the coal-measures at the eastern end of the Sydney coal-field, extending probably as far as the metamorphic rocks of Scatari Island, is now covered by the waters of Mira Bay. The following section, taken by the writer many years ago, from the South Head to False Bay beach, may perhaps be useful in fixing the relations of the seams in question to those of the north side of Cow Bay :

				Ft.	In.	Ft.	In.
Strata				60	0		
Coal	2	0	First group of Seams	4	0	6	6
Fireclay	2	0					
Coal	2	6					
Fireclay	2	0					
Coal	2	0					
Strata				130	0		
Coal	2	6	Second group of Seams	12	0	11	6
Fireclay	3	0					
Coal	1	6					
Shale	6	0					
Coal	4	0					
Fireclay	3	0					
Coal	3	6					
Strata				30	0		
Coal	0	9	Third group of Layers	14	0	1	4
Fireclay	4	0					
Shale	6	0					
Coal	0	4					
Fireclay	4	0					
Coal	0	3					
Strata				70	0		
Coal						1	0
Strata				50	0		
Coal						2	0
Strata, including some thin coals, down to the Tracey Seam				2,200	0		
				2,570	0	22	4

Coal	22	4
Total Thickness	2,592	4

There is some difference of opinion respecting the identity of certain seams in the Glace Bay and Cow Bay basins, but it seems to be generally admitted, by those who have carefully studied the subject, that the Phelan seam of the Glace Bay is the equivalent of the McAulay seam of the Cow Bay basin.

Referring again to the section of the Glace Bay basin, the reader will observe that there are four seams designated the Lorway, the Gardener, the 'Two-Feet,' and the Martin seams. None of these have yet been traced far to the eastward, but it is probable that they continue in that direction, and run out on the north side of the anticlinal. If this be so, they are probably the equivalents of theLong Beach seams ; and the Six-Feet seams, on the north side of Lingan Harbour, three miles to the westward of the Lingan Mines, may be the continuation of the Tracey seam of the Cow Bay basin. It is expected that an examination of the coal-field will soon be undertaken by the accomplished geologists of the Canadian Survey, when these points will, no doubt, be satisfactorily determined ; and the limits of the coal-field to south-westward of the Cow Bay road (where some thin seams of coal have been discovered) be correctly ascertained.

The Lingan and Low Point District, bounded on the north by Sydney Harbour, on the south by Indian Bay, and on the North-east by the sea coast, covers an area of about fourteen square miles containing several valuable seams of coal. It is separated from the Glace Bay basin by an anticlinal, the result, probably, of a fault which may be seen in the cliff a short distance to the northward of Little Head, and which may be traced in its course to the westward, by means of several perennial springs issuing at the surface along the line of fracture. On the north side of the fault or anticlinal, the coal-measures seen in the cliffs of Indian Bay dip, N. 34° E., or nearly at right angles to the dip of the Glace Bay series on the south shore of the same bay. From the North Head of Indian Bay to Low Point—a distance of five miles, the coal-measures are clearly exposed in the cliffs running nearly parallel to the coast as far as the Barasois with a strike of N. 56° W. and dip of twelve degrees. At the Barasois the strike begins to bend round to the westward, and the dip of the beds to increase, the former being N. 80° W. and the latter seventeen degrees, half a mile to the eastward of the lighthouse. On the south shore of Sydney Harbour, from the lighthouse to McPhee's ferry, the strike of the measures is nearly due west, the dip varying from thirty-nine degrees, half a mile to the westward of the lighthouse, to thirty degrees at the Ferry.

The three lowest seams in the following section of the Lingan series are seen in the cliff between the North Head and the harbour; all the others crop out in succession along the coast towards the lighthouse, where the Carr seam—the highest in the section—forms the common starting-point of the Lingan and Low Point series. The strike of several seams, is parallel to that of the main seam, which has been correctly ascertained in the pit workings extending nearly a mile from the shore of Indian Bay towards Low Point. The outcrops of some of the seams have been observed in the brooks running into the Barasois Pond about a mile further to the westward, but their identity has not been determined.

Section of Lingan Series in descending order.

				Ft.	In.	Ft.	In.
	Strata of Sandstone and shale			40	0	..	
1	Coal (Carr's Seam)			..		4	0
	Strata			220	0	..	
2	Coal. Fireclay Coal.	2 2 6	8 0 0	(Barasois Seam) 2	0	8	8
	Strata			54	0	..	
3	Coal (Dunphy's Seam)			..		4	0
	Strata			81	0	..	
4	Coal. (David's Head Seam)			..		7	0
	Strata			240	0	..	
5	(North Head Seam).			..		3	0
	Strata.			82		0	..
6	Coal Shale Coal	3 0 6	0 1 8	(Lingan Main Seam*) 0	1	8	8

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* The above section was taken at the sea-shore. As the works progressed the shale became gradually thicker, until it exceeded eight feet at a distance of three quarters of a mile from the shore, when it began to decrease. A similar change occurred in the Phelan Seam in the Bridgeport workings on the south side of Indian Bay, where the same layer of shale four inches in thickness on the shore, in the

	Strata				83	0	..	
7	Coal (not named)				..		2	3
	Strata, with some thin layers of coal				125	0		
8	Layers of Coal and Shale	0	8	(Lowest Seam)	0	8	..	
	Coal	2	8					
					927	9	40	3
	Coal.				40	3		
	Total Thickness				968	0		

No portion of the Sydney coal-field presents such a perfect section of the measures as the Low Point shore, where the high angle of dip brings the outcrops of nine seams, all except two of workable thickness, nearer to one another than in any other district. The following section, chiefly compiled from a report made by Dr. Dawson for the Victoria Mining Company in 1868, shows their thickness and relative position :—

					Ft.	In.	Ft.	In
	Strata of Sandstone, Shale, &c				40	0	..	
1	Coal (Carr's Seam)				...		4	0
	Strata				400	0	.	
2	Shale and Coal	1	3	(Paint Seam)	4	4	9	0
	Coal	1	0					
	Underclay	1	7					
	Coal	1	0					
	Shale	0	4					
	Coal	3	0					
	Shale	1	2					
	Coal	4	0					
	Strata				200	0	.	
3	Coal (Crandall Seam)				..		4	4
	Strata				400	0	..	
4	Coal (Ross Seam)				..		6	7
	Strata				325	0	...	
	Coal (William Frazer Seam)				..		3	0
	Strata				112	0	..	
6	Coal (Number Three Seam)				..		3	0
	Strata				138	0	...	
	Coal				..		5	9
	Strata				122	0	..	
7	Coal (Daniel McGilvary Seam)				..		2	0
	Strata, with some thin layers of coal				1,000	0	..	
8	Coal	0	4	(Frazer Seam)	0	8	4	2
	Clay	0	4					
	Coal	0	4					
	Clay	0	5					
	Coal	3	6					

---

course of half a mile increased to 28 feet. It then began to decrease rapidly, and has entirely disappeared in the workings of the Caledonia Colliery further to the eastward.

Brought forward	2,742	0	41	1
Coal . .	. 41	1		
Total. .	2,783	1		

Comparing the number, thickness, and position of the several seams in the two preceding sections, it will be noticed that, with one exception, their coincidence is very remarkable. From No. 1 to No. 5 the agreement is perfect. although the thickness of the intervening strata, in the Low Point, is nearly four times greater than in the Lingan section—a phenomenon by no means unusual in almost every coal-field where the persistency in the coal seams exceeds that in the sedimentary strata with which they are associated. The exception just mentioned occurs in the Lingan seam No. 6, consisting of two beds of three feet and five feet eight inches of coal, separated by only one inch of shale, at Indian Bay, which is represented by the 'Three Feet' and the McGilvary five-feet seams, separated by 138 feet of strata, on the Low Point shore. The variable thickness of the shale parting in the Lingan seam has been already pointed out—See footnote page 23 :—with such an instance as an increase of twenty-eight feet in half a mile before us, it is not unreasonable to assume that the same bed of shale has increased to 138 feet in a distance of seven miles, more especially when it is borne in mind that the whole of the associated strata on the Low Point shore have increased to the extent previously stated.*

As it is generally admitted that the McAulay seam of Cow Bay, the Phelan seam of Glace Bay, and the main seam of Lingan (No 6), are identical ; and, as the latter has been traced to the Low Point shore where it splits into the 'Three Feet' and the Hugh McGilvary seams, it follows, of course, that the Daniel McGilvary seam (No. 7) and the Frazer (No. 8)—the lowest in the section—are the equivalents of the Spencer and McRury seams of the Cow Bay series. According to this view the Three Feet, the Low Beach, and the Tracey seams of the Cow Bay series, comprised within a perpendicular depth of 2,750 feet, are entirely absent in the Low Point Section, This difficulty, it is hoped, will be cleared up when the country between the Low Point shore and Lingan Harbour—at present a 'terra incognita' in a geological sense—has been thoroughly examined.

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* One of the most remarkable instances of the splitting of a coal-seam occurs in the northern part of the South Staffordshire coal-field, where the several beds of the 'thick coal' or 'ten yard' seam have been split into nine distinct seams, the highest and lowest being separated by 420 feet of sandstones and shales, within a distance of five miles.

A still greater difficulty presents itself when we attempt to trace the connection between the coal measures of the Low Point and the Sydney Mines series. We must trust to the investigations which, in the course of time, will be made by parties interested in mining pursuits, or to the surveys which ere long will be made by the Government geologists, to unravel these difficulties. (See Appendix.)

CHAPTER IV.

Although the lower carboniferous rocks extend, without interruption, along the western coast of Cape Breton, from Sea Coal Bay, at the southern end of the Gut of Canceau, to Cheticamp on the shore of the Gulf of St. Lawrence—a distance of eighty miles—small patches of the productive coal measures have only yet been discovered at Port Hood, Mabou, Broad Cove, and Chimney Corner in the county of Inverness, and at Sea Coal Bay in the county of Richmond. At all these places the measures consist of strata of sandstone and shale, similar to those of the Sydney coal-field, resting upon the millstone grit, and containing several seams of coal of considerable thickness but of small extent, being evidently detached portions of a large coal-field lying under the waters of the Gulf of St. Lawrence, separated from each other in most cases by undulations of the lower carboniferous rocks projecting into the sea. As the lower members of the carboniferous series extend from the coast, at least ten miles inland, towards Margarie River and Lake Ainslie, it is very probable that small basins of the coal measures may some day be discovered in the interior. Two thin seams of coal have, indeed, been discovered on the eastern flanks of the conglomerate hills near the mouth of Middle River, which runs into the Bras d'Or Lake, but they probably are of older date than the coal measures on the Gulf shore, being apparently members of the carboniferous limestone formation. They are of no economic value.

At Port Hood, a small patch of coal measures extends about two miles along the coast and half a mile inland, dipping to the north-west at an angle of twenty-seven degrees. Only one seam of workable thickness has yet been discovered, which crops out 360 feet from high water mark. Several thin seams are said to lie beneath, cropping out further inland ; and one, supposed to be six feet thick, can be seen, at very low tide, dipping under the sea, which of course overlies the seam first mentioned. No regular section has been made, but the following shows the position of those above noticed :—

				Ft.	In.
Coal seen at low water supposed to be				6	0
Strata				360	0
Coal	1	0	(Seam worked)	6	0
Coal and Shale.	0	9			
Coal	4	3			
Strata, containing several seams under 20 inches in thickness				1,500	0
Total				1,872	0

At Mabou, ten miles to the northward of Port Hood, several seams of coal—one thirteen feet in thickness—are found on both sides of a narrow basin not more than half a mile in diameter in the direction of the coast line, extending westerly under the sea. About half a mile further north a similar series of seams occurs, having a northerly dip, forming the southern side of another basin, supposed to be identical with the preceding; but it must be noted, however, that the north side of this second basin has not yet been determined. These two basins, caused by an undulation of the measures, were probably once united, and have been separated by the denudation of the strata which covered the crest of the anticlinal. The outcrops of four workable seams of coal have been examined in this locality, dipping northerly, on the south side of the first basin, at an angle of seventy degrees, within a horizontal distance of 200 yards ; consequently, the vertical depth of the strata associated with them will not exceed 550 feet. As no section of the strata has been made, the thickness of each seam can only be given as follows :—

	Ft.	In.
The first or highest seam	5	0

" second	7	0
" third	13	0
" fourth	3 0 to 4	6

The fourth bed, composed partly of cannel coal, is said to lie only a few feet below the thirteen-feet seam. The range of the beds inland being very small, this accumulation of twenty-nine feet of coal within a vertical depth of only 550 feet, which, under more favourable conditions, would be exceedingly valuable, may be considered at the present day of little importance for mining purposes.

At Broad Cove, twelve miles further to the north, midway between Mabou and Margarie River, there is another patch of coal measures, occupying an area of about one square mile, dipping to the north at an angle of ten degrees, but it does not appear that any attempt has been made to ascertain its correct limits. The following section has been compiled from a report made in 1865 by a surveyor for the Broad Cove Mining Company :—

	Ft.	In.
Coal (the highest bed)	3	0
Strata	340	0
Coal	5	0
Strata	100	0
Coal	7	0
Strata	240	0
Coal	3	6
Total	698	6

There are said to be indications of other seams between the first and third of the above series, but no openings have been made upon them. (See Appendix.)

At Chimney Corner, eight miles to the south of Margarie Harbour, three seams of coal are seen in the cliffs, dipping to the north at an angle of forty degrees, but their extension inland has not yet been ascertained. Like the areas previously described, the Chimney Corner tract merely forms part of the margin of a basin lying under the sea. Their thickness and position is shown in the following section *:—

	Ft.	In.
Coal (the highest bed)	3	0

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* The writer is indebted for most of the information above given relative to the coal seams at Port Hood, Mabou, and Chimney Corner, to a valuable article in the Transactions of the North of England Institute of Mining Engineers, by, J. Rutherford, Esq., Government Inspector of Mines in Nova Scotia.

Strata	88	0
Coal.	5	0
Strata	200	0
Coal	3	6
Total	299	6

It is not likely that the coal seams of Inverness will supply much coal for the market for many years to come, as the Sydney coal-field, so much more favourably situated both for working and shipment, will furnish all that will be required for many generations at less cost; but with a large export to the United States, the certain establishment of extensive iron works and other manufactories in the colonies, and a vastly increased consumption of coal by steamers, which are rapidly driving sailing vessels off the ocean, the most accessible parts of the Sydney coal-field will, in the course of time, be exhausted, when the coal seams of Inverness must be worked to meet the supply required. In view of this contingency—distant though it may be—immediate steps should be taken by the Government to ascertain the exact situation and economic value of every seam of coal in Inverness; because, owing to the rapid wearing away of the cliffs on a coast exposed to the heavy surf of the gulf during the prevalent north-west winds, and to the combined action of severe frosts and rapid thaws, all vestiges of these valuable coal seams will soon be entirely obliterated. In proof of this view it need only be stated that Seal Island, composed of carboniferous strata, which, beyond all doubt, was once connected with the mainland, is now separated from it by a channel two miles in width, the intervening land having been entirely swept away by the waves. It is evident, therefore, that a belt of coast, at least two miles wide, has disappeared, effacing the outcrops of many valuable seams of coal. If this process be repeated to the extent of only one mile more, it is equally evident that all the outcrops now visible will be washed away, leaving 'not a wreck behind.' If correct plans are now made, showing the position of every seam, at a future time, when all traces of them have disappeared, they may be reached by cross-cuts driven from the bottom of shafts sunk upon the adjacent shore, and worked under the sea.

The Richmond Coal-field—the only one that now remains to be noticed—is situated at the southern extremity of the island, between the river Inhabitants and the Gut of Canceau. The carboniferous rocks in this district cover an area of about twenty square miles, and contain several workable seams of coal. In the cliff on the western shore of Sea Coal Bay, close to the southern end of the Gut of Canceau, there is a seam eleven feet in thickness, composed of alternating layers of coal and bituminous shale; another, four feet thick, of clear coal; and a third, five feet and a half thick, including a fifteen inch layer of shale in the middle. All these seams occur within very narrow limits, dipping to the south-west at an angle of eighty degrees.*

At Little River, a small stream running into Sea Coal Bay, two miles and a half to the north-east of the preceding locality, there are two seams, one three, the other four feet in thickness, nearly in vertical position, separated by 154 feet of sandstones and shales. Traces of coal have also been seen at two places to the eastward, near the mouth of the river Inhabitants. The measures in this coal-field are, however, so much disturbed by faults, that the extent and relative position of the several seams cannot be made out; any attempt to ascertain the true position, extent, and consequent value of the seams, will be attended with much expense, as the country is low, and there are few cliffs or natural sections; the out-crops of the strata also are concealed by a thick deposit of boulder-clay. The seams all occur in situations favourable for shipment, but it is not likely that, unless they can be found in less highly inclined positions, they can be worked with profit to any great depth, as, in addition to the difficulty of working vertical seams, the expense of keeping the mines free from water will be a very serious obstacle, and greatly increase the cost of production.

In compiling the preceding sketches, brief and imperfect as they must necessarily be within such narrow limits, the writer begs to say that his information has been derived either from authentic sources or his own personal observation, and that the reader may rely upon their accuracy in forming his estimate of the comparative value and importance of the various establishments in the island, which will be described in a future chapter. In the mean time it will be necessary to devote two or three chapters to the consideration of the rise and progress of the coal trade previous to the year 1858, when the General Mining Association surrendered their exclusive right to *all* the mines and minerals of Nova Scotia and Cape Breton, except certain stipulated areas in the coal-fields.

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* Dr. Dawson, who was employed by the Government to make a survey of the district, says that the eleven-feet bed has been thrown over on its face, so that the underclay, which was originally the floor now forms the roof of the seam.

CHAPTER V.

From the discovery of the island of Cape Breton by Sebastian Cabot in 1498, to the year 1672—a period of nearly 200 years—although numerous voyages were made to the coast by intelligent enterprising navigators, there is no mention whatever, in any of their narratives, of the existence of the coal seams which, being plainly visible in the cliffs of almost every bay or headland, could not possibly have escaped observation. Captain Strong of the 'Marigold,' who visited Cape Breton in 1593, has given us an account of the chief productions of the island, including the various kinds of trees and even small shrubs, but has not once mentioned the coal seams; and Captain Leigh, of the 'Hopewell,' who spent several days on the coast in 1597, and landed, as he tells us, at five different places, all in the middle of the Sydney coal-field, is equally silent upon the subject. Both of these navigators—evidently, judging from their narratives, intelligent and observing men—must have been well aware of the value of coal as an article of commerce, as the English coal trade flourished greatly in their time (the reign of Elizabeth), and was considered an important source of national revenue.

It is still more surprising that Champlain, a man of education and a keen observer of natural phenomena, who circumnavigated the island in 1607, and has given us accurate descriptions of the chief harbours, and some account of the productions of the island, does not make the slightest allusion to the coal seams, although he notices such small matters as the abundance of oysters; adding, which by the way is not true, that they are of very poor flavour.

Joan de Laet, in his history of the New World, is equally silent about coal in his enumeration of the nattural productions of the island ; but he does not forget to tell us that such 'small deer' as crabs and lobsters are found 'in almost incredible abundance in the harbour, which the savages, in their language, call Cibo' (Sydney),

The first printed notice of the existence of coal in Cape Breton is met with in the 'Description geographique et historique des Costes de l'Amerique Septentrionale,' by Nicholas Denys, published in Paris in 1672. According to the historian Charlevoix, Denys was appointed governor of all the eastern part of Acadia, including Cape Breton, in the year 1637. He subsequently obtained a concession (in 1654) from Louis XIV. of the whole island, with full powers to search for and work mines of gold, silver, copper, and other minerals, paying to the king one-tenth of the profit. In the preface to his book, he says, 'There are mines of coal through the whole extent of my concession, near the sea-coast, of a quality equal to the Scotch, which I have proved at various times on the spot, and also in France, where I brought them for trial.' He adds, 'at Baie des Espagnols (Sydney) there is a mountain of very good coal, four leagues up the river,' and 'another mine near the little entrance of the Bras d'Or Lakes ;' also, that 'at LeChadye, on the north-west coast (probably Mabou), there is a small river suitable for chaloups, where there is a plentiful salmon fishery and a coal mine.' Being almost exclusively engaged in the fisheries and fur trade, Denys, during his long residence in Cape Breton, made no attempt to work the coal seams, for want, probably, of a market. After his departure, in 1672, it appears that unauthorised persons helped themselves to whatever coal they needed from the cliffs, without permission from his sons, whom he left in charge of his property, as an ordonnance was issued on August 21, 1677, by M. Duchesneau, the Intendant of New France, recognising and establishing Denys's right to exact a duty of twenty sous per ton from all persons taking coal from Cape Breton. Denys's patent seams to have been revoked in 1690.*

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The importance of the coal of Cape Breton was fully recognised in a memoir, submitted in 1708 to the French government by M. Raudot, intendant of the finances, and his son, intendant of the marine of Canada, recommending the establishment of an entrepot on the sea-board, open at all seasons of the year, where the productions of Europe and the West Indies could be stored ready for shipment to Canada. The Messrs. Raudot recommended that a port in Cape Breton should be chosen for this purpose, 'as the island could furnish old France with coal, codfish, oils, plaster, and timber, of its own growth and produce.'

The next notice of the coal of Cape Breton occurs in the Journal of Admiral Hovenden Walker, who commanded the unfortunate expedition sent to reduce Quebec in 1711. Several ships and nearly a thousand men having been lost at the mouth of the St. Lawrence, owing, as it was alleged, to the ignorance of the pilots, it was decided at a Council of War to give up the enterprise and proceed to Spanish Bay (Sydney), which had been selected as the most convenient rendezvous in case of the fleet being dispersed. Admiral Walker says, 'The island had always, in time of peace, been used in common both by the English and the French for loading coals, which are extraordinarily good here, and taken out of the cliffs with iron crow-bars only, and no other labour.' The English, who took coal in common with the French, were most likely New England colonists, who fished on the coast in summer and carried away a few tons of coal on their homeward voyage; the same, probably, that helped themselves some years before without permission from M. Denys.

The first attempt at mining, in any thing like a regular form, was made upon the ten-feet seam on the north side of Cow Bay in 1720, when it was found necessary to obtain a supply of fuel for the host of officers, soldiers, mechanics, traders, and labourers, who went out to lay the foundations of the celebrated fortress of Louisbourg. Some relics have been found recently in the old workings, but they may have belonged to a later period. Cargoes of coal were, about this time, exported from Cow Bay to Boston; for, although direct trade between the French and English colonists was forbidden by the treaty of neutrality, the New

Cow Bay
1720

England traders, notwithstanding, carried on an active clandestine trade with Louisbourg, receiving French products in exchange for bricks, lumber and provisions. When Messrs. Bradstreet and Newton visited Louisbourg, by order of the Governor of Nova Scotia, to demand redress for the depredations committed by the Cape Breton Indians at Canceau, in 1724, they found fourteen English trading vessels in that port, exclusive of one which had left to load coal at Cow Bay for Boston. This small beginning was, perhaps, the inauguration of the foreign coal trade at Cape Breton. In 1728 the French shipped some few cargoes to Martinique for boiling sugar, but from that time until the fall of Louisbourg, in 1745, there are no records of any further exportations. The value of the coal-fields of Cape Breton had, at this time, become well-known in France, as Charlevoix states, in his 'History of New France,' published in 1744, that the 'island abounded in coal pits, which were in the mountains; consequently, the trouble and expense of digging deep and making drains to carry off the water were greatly saved.' Three places, in the map appended to his work, bear names indicative of the known existence of coal in their vicinity, namely, Ance du Charbon, Cap Charbon, and Baie du Charbon, now called Big Pond, North Head of Indian Bay, and Schooner Pond Cove respectively.

Whilst England held possession of Cape Breton, from its conquest in 1745 to its restoration to France in 1749, the garrison of Louisbourg was supplied with coal from mines opened at the Burnt Head and Little Entrance of the Bras d'Or. It is quite evident the garrison was abundantly supplied, for Admiral Knowles, the governor, complains that 'the cost of fuel in the winter of 1745-46 was £6,000, notwithstanding the number of houses that were pulled down and burned.'

Colonel Hopson, who succeeded Admiral Knowles in the government of Cape Breton, reported in April 1748, to the Duke of Newcastle, that he was apprehensive of an attack upon the colliery at Burnt Head by the Indians, who were warmly attached to the French, and that he had sent to Boston for a blockhouse to be erected there for its protection. The blockhouse was surrounded by a ditch (the remains of which may still be seen), and garrisoned by an officer and fifty soldiers.

Blockhouse
Burnt head.

An officer and a few soldiers were also stationed at the Little Entrance of the Bras d'Or. Here, also, may be seen the ruins of an old building which still goes by the name of the 'King's Store.'

The workmen employed at Burnt Head were mostly Frenchmen, who had remained in Cape Breton after the fall of Louisbourg, and taken the oath of allegiance to the British sovereign. Some of them owned small vessels, in which they carried coal and wood to Louisbourg for the use of the English garrison. Having rendered themselves obnoxious to their old compatriots by taking the oath of allegiance, these unfortunate Frenchmen were attacked in their settlement at Indian Bay in the month of July, 1748, by a band of forty French Canadians, led by a noted rover named Jacques Coste, when their houses and about 2,000 cords of wood were burned and three of their vessels captured. Coste carried off twenty-four men and women from Indian Bay, and an English officer and one soldier from the Little Entrance of the Bras d'Or, to Canada. No attempt was made upon the colliery and fort at Burnt Head, commanded by Lieutenant Rhodes; but owing to the capture of the schooners and their crews, Louisbourg was deprived of its usual supply of coal for more than a month. The Abbe Raynal says, in his 'History of Commerce,' that there was 'a prodigious demand for Cape Breton coal from New England from the year 1745 to 1749;' but there is nothing in the Colonial Documents in the Record Office to show that any considerable quantity of coal was shipped from Louisbourg.

During the occupation of the island by the French, from its restoration in 1749 to its second and final conquest in 1758, it does not appear that much coal was exported to the British colonies, although an active trade was carried on by the English colonists with Louisbourg at this period, as Colonel Cornwallis, the Governor of Nova Scotia, says that, in 1751, 150 vessels belonging to New York and Boston traded with Louisbourg; and his successor, Colonel Lawrence, complains, in 1754, that the Boston traders supplied Louisbourg in preference to Halifax with provisions, and that there were sometimes thirty of their vessels lying in the former port. It is reasonable to conclude that some of these vessels occasionally took return cargoes of coal from Cape Breton, but there is no record of such a trade having subsisted. In confirmation of this the Abbe Raynal says 'the mines would probably have been forsaken altogether during the French occupation of the island, from 1749 to 1758, had not ships sent out to the French West India Islands wanted ballast.' M. Pichon, secretary of Count Raymond, the Governor of Louisbourg, tells us, in his 'History of Cape Breton,' published in 1760, that he accompanied a party of officers sent by the Governor in the spring of 1752, to survey the coasts of the island and to collect statistical information. In the course of their travels they visited all the bays and harbours on the north-east coast; but Pichon says nothing about the mines except that 'there were two pits [he probably means seams] at Baie des Espagnols (Sydney), and that the English had a coal pit at Burnt Head defended by a fort of considerable strength, where, with fifty men, they successfully repulsed the attacks of the savages and kept possession of the fort.' He adds, that the pit took fire in 1752, when the fort also was entirely consumed. Traces of this fire may still be seen along the outcrop of the seam as far as Glace Bay, a distance of nearly one mile.

There are no records of any coal having been raised in Cape Breton for several years following the reduction of Louisbourg in 1758, except about 3,000 tons annually for the use of the garrisons at that place and at Halifax. It is stated, in a letter from Lieut-Colonel Francklyn to the Lords of Trade, that this coal cost the Government four shillings per ton, exclusive of implements and stores.

After the Treaty of Paris, in 1763,[*] instructions were sent out to the Governor at Halifax to issue free grants of land, in Nova Scotia proper, to the officers of the army and navy who had served in America; but he was requested to issue no grants in Cape Breton, which was then annexed to Nova Scotia, until an accurate survey should be made of the island. This survey was not completed until 1767; but, in the meantime, as the prohibition did not extend to the leasing of mines, several officers, who had noted the great value of the coal seams, applied for leases in Cape Breton.

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[*] The existence of coals on the Wabash, in Indiana, was observed by Col. Croghan in 1763, when he was a prisoner in the hands of a band of Indians. The Pittsburg coal was not discovered until 1770 The anthracite coal field of Pennsylvania was discovered about the same time.

On March 19, 1764, Brigadier-General Howe and some other officers of distinction, who had served in the late war in America, petitioned the king for a grant of land in Cape Breton, 'being,' as they stated, 'desirous of becoming adventurers in opening coal mines, and of endeavouring to establish a colliery for the better supplying the several colonies and garrisons on the Continent with fuel. That, to enable them to carry this their design into execution, they humbly pray to have granted to them as their allotment a tract of land on the east shore of the island, extending from the point on the north side of Mira Bay to the south-east side of the entrance into the Bras d'Or and seven miles inland, and supposed to contain about 55,000 acres.' They offered to pay a royalty of two shillings sterling per chaldron, London measure, on every chaldron exported.

In the month of May, 1764, Sir Samuel Fluyders. and three associates applied to the Lords of Trade for a lease of all the coals in the island, offering, 'upon having the mines for ten years free of tax, to pay two shillings and sixpence sterling for every chaldron they ship for the further term of ten years; three shillings and ninepence for the next ten years; and five shillings per chaldron for the last ten years of their lease.' In a subsequent application, Sir Samuel and his friends, finding, probably, there was no chance of obtaining the whole island, asked for a grant of 100,000 acres between the Mira River and the great entrance of the Bras d'Or, and a lease of all the coal thereon for thirty years; undertaking to settle thereon not less than one hundred persons every five years; to build a town on one of the harbours; to pay a quit-rent after the first ten years of two shillings and one penny upon every hundred acres of land; and a royalty of two shillings and sixpence sterling per chaldron during the first ten years, and five shillings per chaldron during the remainder of their lease on all coal exported.

Neither of these proposals was accepted by the Government, although the Lords of Trade recommended that a lease should be granted to Brigadier-General Howe and his associates, because it would be the means of lowering the price of coal in England, from which large quantities were exported to America; would be a boon to the colonies, where fuel was becoming daily scarcer; and would be a source of considerable revenue.*

Several other applications were made for leases about the same time, but only one will be noticed, as it shows the exaggerated notions which then prevailed of the extent of the coal seams in Cape Breton. 'A design is on foot for establishing a company to work to advantage the coal mines, which have this great superiority over all others, that the coals are within three feet of the surface, and the most excellent ever seen. There will be no occasion for digging underground, or making drains to carry off the water, as in England, for the mines consist of entire mountains of coal, and are sufficient to supply all the British plantations in America for ten centuries.'† This very flattering 'design,' like its predecessors, came to nought, as likewise did a scheme for making salt, started by one William Hutton in the same year, who obtained permission to dig for coal at any place except where the troops were at work.

Notwithstanding the failure of so many attempts to obtain leases, others, with more moderate, and consequently more feasible views, were anxious to embark in coal-mining. In the month of September 1766, Lieut.-Colonel Francklyn, the Governor of Nova Scotia, understanding that applications would shortly be made for leases, addressed a letter to the Lords of Trade, giving such information as he thought would be useful to their lordships in forming a just appreciation of the coal seams, and concluded by recommending that the mines should be leased. He stated in his letter that the only mine then open was situated on the north shore of Cow Bay‡ and that the establishment consisted of a picketted fort 100 feet square, with blockhouse, barracks and store-houses; also a wharf convenient for shipment close to the mines. Vessels of 80 to 100 tons could load at this wharf between June 1 and October 15, 'when the wharf must be taken down and rebuilt in the spring, the bay being so open, and the drifts of ice so violent, as to carry it away in the winter season.' He says the mine is in good order and well propped, 'the vein being good, and, as he was told, twelve feet thick and half a mile wide,' and could employ twenty men daily. Francklyn proposed that coal should be sold at the mines for exportation, and recommended that it should be taken to Halifax for reshipment in vessels going out in ballast He calculated that a revenue of 500*l*. to 1000*l*. might be raised, which he proposed to expend in making roads. This wise advice, however, was not followed; on the contrary, at a Council held at the Court of St. James's on December 3, in the same year, 'His Majesty, with the advice of the Privy Council, declared his royal pleasure not at present to authorise or permit any coal mines to be opened and worked in the island of Cape Breton, and that all petitions and proposals for that purpose be dismissed this Board.'

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‡The site of the works now known as the Block House Mines

* Records in State Paper Office.

† Scot's Magazine, July, 1765.

It might have been supposed that this clear and positive order would have been strictly complied with, yet it appears from the Records that Lord William Campbell, who was appointed Governor of Nova Scotia in November 1766, granted an exclusive right, in the month of April following, to Benjamin Gerrish, William Lloyd, James Armstrong, and Peter Bard, merchants of Halifax, to dig 3,000 chaldrons of coal 'anywhere, except from such places where his Majesty's troops were at work digging for the use of the garrisons.' The grant, which was to determine in eight months, authorised the lessees to raise 3,000 chaldrons, paying 400*l*. sterling for the privilege, with a provision that, in case of any sudden or unforeseen accident they were prevented from digging and carrying away 3,000 chaldrons in eight months, a reasonable extension of their time should be allowed. The lessees were also bound to send 1,500 chaldrons to Halifax, and to sell it there at no higher rate than twenty-six shillings sterling per chaldron. Gerrish and his partners opened a mine at Spanish River (Sydney)—the exact locality is not mentioned—from whence they shipped during the year—

To Halifax	1,783
" New York	70
" Providence	54

" Boston	44
" Philadelphia	45
" Louisbourg	76
" England	217
	2,279 chaldrons

On February 22, 1768, they petitioned for further time to enable them to ship the balance of their contract, alleging 'that it could not be completed in the time specified, because several of their works had fallen in; larger quantities than usual had been imported from Europe; and a large quantity of coal had been smuggled from Cape Breton to New England by one Alexander Lee,* of Louisbourg, which brought down the price so much that it would not pay them to ship more than above mentioned.' This contravention of the king's order did not escape the notice of the Secretary of State, who called upon the Governor to state why he had granted a lease to Gerrish and his partners in direct opposition to his Majesty's orders, to which Lord William Campbell replied that, 'having been told the coal composed the surface of the island, and could be easily taken away by any adventurer,' he considered it was better to use it and apply the proceeds to the making of roads in the province. He also informed the Secretary of State that the mines had been quite neglected since 1758, and that if the detachment of the 59th Regiment was removed from Louisbourg, 'the coal mines in the neighbourhood could be uninterruptedly worked by any people who thought proper to go there, as the prohibition before proceeded from a fixed guard of troops on the spot.' He suggested, at the same time, that the soldiers stationed there might be usefully employed in working the mines.

In the month of February 1768, the Secretary of State again informed the Governor that 'no more licences must be granted for taking coals from the cliffs in the island of Cape Breton.' It is hard to conceive what could have been the reason for persisting in this mistaken policy; for if short leases had been granted, a great deal of coal which fell from the cliffs every spring, and was washed away by the surf might have been collected to supply Halifax with fuel. Besides, it would have saved the Government a vast amount of trouble and expense in keeping off trespassers, who about this time carried off large quantities of coal from the cliffs. This illicit traffic continued to increase to such a degree, that the governor, on May 4, 1770, informed the Council he had applied to Lieut.-Colonel Leslie, commanding his Majesty's troops in the province, and had obtained from him a promise to furnish a sufficient force to prevent trespassing on the king's rights in future, and that he wished to learn the opinion of the Council as to the measures proper to be taken. 'On which the Council advised that the chief magistrate at Louisbonrg should be directed to proceed to Cow Bay, and require all persons there* to depart immediately; and that he should put the troops into the barracks or houses there belonging to the king, giving them orders to prevent any coals being dug or carried thence without the Governor's special order. It was ordered also that a proclamation be issued, strictly prohibiting all persons to dig or carry away any coals from the Isle of Breton.' A detachment was accordingly sent down to Cow Bay early in the spring, where 500 chaldrons of coal, dug by trespassers during the previous winter, ready for shipment, were seized and sent to Halifax for the use of the troops.

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* March 22nd, 1767. Alexander Lee was prosecuted by the Attorney General for having, contrary to the Governor's proclamation, dug and carried away a large quantity of coals from Cow Bay, in the Isle of Breton. (Minutes of Council.)

Both the garrison and town of Halifax were about this time chiefly supplied with coal from a mine recently opened at Spanish River (Sydney), which was worked by soldiers, but when the troubles began in the British Provinces (now the United States), and a large force was collected there, the troops consumed so much coal that the town suffered greatly from the scarcity of fuel. In this difficulty the House of Assembly, in 1775, petitioned the king for leave to dig coals in Cape Breton, but apparently without success. In 1777 forty men of Colonel Legge's regiment were employed in digging coals at the Spanish River mines. During the American revolutionary war, it was found necessary to send ships of war to convoy the vessels employed in carrying coal from Spanish River to Halifax for the use of the garrison. On July 21, 1781, sixteen vessels employed in this service, accompanied by a transport having a party of the 70th Regiment on board, going to work at the mines, convoyed by the 'Charlestown' frigate, of twenty-eight guns, the sloops, 'Allegiance' and 'Vulture,' of sixteen guns each, and the cutter 'Little Jack,' of six guns, had nearly reached their destination, when they were discovered and chased by two French frigates, the 'L'Astree'* and 'L'Hermione,' of forty-four guns each. A smart action commenced at 8 P. M., which continued until dark, when the French frigates drew off, taking with them the 'Little Jack.' Owing to the skilful management of Captain Evans, of the 'Charlestown,' who was unfortunately killed, the transport and colliers got safely into Spanish River. The frigate and sloops, being greatly crippled in the action, bore up for Halifax.

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* The coal smugglers, as they were styled, had not only dug a large quantity of coal, but had cooly taken up their quarters in the old barracks where they resided without molestation.

So far, as the reader will observe, nothing like a regular mine had been opened in Cape Breton. Nor is this to be wondered at, seeing that the Government persisted in the absurd policy of refusing to grant leases to parties who, with fair encouragement, would have worked the mines efficiently, and sought for markets in the neighbouring colonies. Even when the Government undertook the working of the mines, no regular system was pursued. Having obtained all that was easily accessible from the face of the cliff at one place, instead of driving a level further into the seam, it was abandoned, and work commenced at another. That the contraband traders should have followed this system is not surprising, as their works were at any time liable to be taken possession of by the Government. Consequently, when they had exhausted any particular seam, and could not pursue it further without some labour, they removed to another, where the coal could be literally shovelled from the outcrop into their boats. Under such circumstances, the reader will not be surprised to learn that, after the island had been twenty-two years in the undisturbed possession of Great Britain, and surrounded by colonies requiring large supplies of fuel, the quantity raised in any single year, as far as we can learn, never exceeded 3,000chaldrons.

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* The 'L'Astree was commanded by La Perouse, the celebrated navigator, who was lost in 1788 on the Isle of Vanikoro, near the New Hebrides.

CHAPTER VI.

When the island of Cape Breton was erected into a separate government in 1784, the first Governor, Lieut.-Col. Desbarres, who had been employed in making a marine survey of the island, and was well acquainted with its mineral resources, directed his earnest attention to the working of the coal mines, which, he felt assured, would prove 'an inexhaustible source of revenue.' Up to this time all the coal shipped at Spanish River* had been taken from the seams cropping out in Lloyd's Cove and Indian Cove; but Governor Desbarres very judiciously commenced mining operations in the 'Six Feet' or 'Sydney main coal,' as it is generally called (see Section, p. 11), on the north side of the harbour, where 400 acres of land were reserved for the special use of the works. The order forbidding the granting of land in Cape Breton, issued in 1763, was revoked when the government was separated from that of Nova Scotia; but it was decided at a council held at St. James's on August 26, 1784, that 'Whereas it has been represented to us that several parts of our island of Cape Breton have been found to abound in coals, it is our will and pleasure, that in all grants of land to be made by you, a clause be inserted, reserving to us, our heirs and successors, all coals, and also all mines of gold, silver, and lead, which may be discovered in such lands.'

Under Desbarres' administration, from 1784 to 1787 inclusive, the mines were worked on Government account by means of a level driven into the seam from the foot of the cliff, where a wharf was constructed for the shipment of the coal. This wharf was repaired and extended from time to time, and continued to be used as the place of shipment until the year 1834. Traces of this wharf and the mouth of the level may still be seen. The selling price was eleven shillings and sixpence per ton; but this left such a small, if any profit to the Government, that Colonel Macormick, who succeeded Desbarres, strongly recommended that the mines should be leased. Accordingly, on January 1, 1788, they were leased to Thomas Moxley, who held them until his death in 1791. Coal was sold during Moxley's lease at eleven shillings and sixpence per ton.* The royalty paid is not given in any of the accounts returned to the British Government. The revenue derived from the mines, at least the balance remaining, after the Governor deducted three shillings and sixpence per ton for his own private use, was paid into the treasury of the colony. This perquisite of the Governor was abolished in 1792 by order of the Secretary of State for the Colonies.

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*Governor Desbarres laid the foundations of a town at the head of Spanish River which he called 'Sydney,' after Lord Sydney, at that time Secretary of State for the Colonies. Spanish River, in consequence, took the name of Sydney Harbour, by which it is still known.

In the month of October 1792, the mines were leased to Messrs. Tremain and Stout for seven years, at a royalty of three shillings per ton, and at the expiration of the lease in 1799 they were allowed to go on as tenants at will, subject to six month's notice. They held the mines until February 5, 1800, upon these terms

To ensure the proper and efficient working of the mines, Sir John Wentworth, the Governor of Nova Scotia, suggested to the Secretary of State, in 1792, that it would be advisable to send out a competent engineer to inspect the mines, and to construct a stone pier at a more convenient place for shipment, as vessels were often detained waiting for their cargoes. Acting upon this suggestion, the British Government, in 1793, sent out Mr. Miller, a mining engineer, who proposed to erect a pier at Indian Cove at an estimated cost of 2,822*l.*; but this was not approved by the Government, as it was considered the amount of the coal sales did not justify such an outlay, especially since the lessees of the mines had just rebuilt the old wharf. Mr. Miller held the office of Government Superintendent of the mines until his death in 1799.†

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* In the documents in the Record Office the quantities of coal are given in *chaldrons*, and the prices, royalty, &c., in *Halifax currency*. To render the returns more intelligible to English readers, the chaldrons are reduced to tons of 2,240 lbs. each, and the prices are expressed in sterling money. This must be understood to be the rule in all cases in the text.

† Mr. Miller was probably the first person who noticed the fossil trees (already mentioned) in the coal measures of Cape Breton. In a private letter, addressed to Mr. King, the Under Secretary of State, he says: 'I had some thoughts of sending a cask of petrified branches of trees, in part converted into coal, to my Lord Duke, if I was assured it would be acceptable to his Grace. This phenomenon favours the opinion that coal strata are no other than decayed forests compressed, indurated, and petrified. I could also send a trunk of a large tree petrified.'

On reference to the Table I. at the end of this chapter, it will be seen that the sales of coal, trifling as they were in amount, were subject to great fluctuations. This was owing, in a great measure, to the extensive depredations committed on the coal seams in the cliffs along the coast. In one year more than 700 tons were taken from Cow Bay and other places to the island of St. Pierre alone. On October 11, 1790, the Governor informed the Secretary of State that at least three cruisers would be required to stop this illicit traffic. I the course of that year, one hired vessel, commanded by Captain Prichard, captured three vessels stealing coal in Cow Bay; three others escaped. In 1795 an ordonnance of Council was promulgated, declaring 'all vessels carrying away coals from the cliffs, without authority, liable to forfeiture.' A more marked improvement, however, it will be seen by the table, occurred towards the close of the century, owing probably to the large supplies required by the great number of troops in garrison at Halifax during the French war. Much apprehension was felt during the war for the safety of the mines, which could easily have been destroyed by the enemy. A block-house, which is still standing, was erected at the mines; and two batteries, of four guns each, were constructed—one in front of the block-house, the other on Peck's Head. No attack, fortunately, was made upon the works, which continued to supply the garrisons of Halifax, St. John's, and St. Pierre during the war.

Upon the expiration of Tremain and Stout's tenancy in February 1800, the Government took possession of the mines and worked them until the end of the following year, under the management of Mr. Campbell, the Attorny-General of the colony! It is not stated whether his management was successful or not, but it is evident he was satisfied that the mines could be worked with profit, as he took them upon a lease of seven years under a royalty of four shillings per ton stipulating, at the same time, to sell the coal at ten shillings and threepence per ton. This, however, does not appear to have answered his expectatious, as he applied in 1803 for a reduction of one shilling and sixpence per ton on the royalty, but failing to obtain it, he not only stopped paying the royalty, but contested several points in his lease, and gave so much trouble, that the Governor recommended the Secretary of State either to cancel the lease or call upon Mr. Campbell to resign his office of Attorney-General.

In the month of May following Campbell surrendered his lease, when the Government again resumed possession, and worked them for several years; not, however, with much success, as we find General Nepean, the Governor, complaining to Lord Liverpool in 1810, that from June 1808, to September 1810, the mines had only realised a profit of tenpence per ton upon a sale of 16,899 tons. This is not surprising, considering that five officers were employed in the management of such a small business, at a cost of 510*l*. per annum, viz.:

	£
Superintendent	100
Agent and shipping officer	225
Medical officer	100
Harbour Master	50
Collector of accounts	35
Total	£510

being thirteen per cent. on the gross amount of the sales in 1810. An attempt was made in 1811 to lease the mines to Messrs. Jonathan and John Tremain of Halifax, who offered to take them for twenty-one years at a royalty of two shillings and one penny per ton. Finding upon more careful enquiry, that the working charges were much greater than they expected, the Messrs. Tremains withdrew their offer, and the Government was compelled to go on working the mines on their own account; but with such small success, that the new Governor, General Swayne, reported to Lord Bathurst in January 1813, that the finances of the colony were reduced to the lowest ebb, and that the coal mines, which were the only source of revenue, were in a state of bankruptcy. In the course of the year 1813 Messrs. Ritchie and T. Leaver took a lease of the mines at a royalty of three shillings and eightpence per ton, which they held until January 31, 1818, when, having got into difficulties, they were obliged to transfer their interest in the mines to their assignees, Messrs. G. W. Brown and J. Leaver, who held them until the expiration of the lease in December 1820. As it was generally expected at this time that the island of Cape Breton would soon be annexed to the government of Nova Scotia, the acting Governor, Captain Stewart, considered it advisable, upon the termination of the last lease, to renew it only for one year to G. W. Bown at a royalty of three shillings and sixpence per ton.

The island of Cape Breton having, by an order of the King in Council, in the year 1820, been annexed to the government of Nova Scotia and constituted a county of that province, under the name of the 'County of Cape Breton,' Sir James Kempt, the Governor of Nova Scotia, in the autumn of the same year, visited the island, with the object of making himself acquainted with its wants and resources. He seems to have devoted his special attention to the coal mines, concerning which he stated, in his report to Lord Bathurst, that the average sales for several years had been about 8,000 tons, and that, in any one year, they had never exceeded 10,000 tons, yielding a revenue of £1,400 to £1,600 per annum to the government. He found fifty-two men employed at the mines, and estimated, from the best information he could get, that the cost of raising and shipping the coal was about seven shillings and sixpence per ton. Mr. G. W. Bown's lease having expired, Sir James Kempt let the mines to Messrs. T. S. and W. R. Bown for a term of five years from January 1, 1822, at a royalty of four shillings and three pence per ton, stipulating that the lessees should keep the works in efficient condition to meet the demand, and that they should not sell at a higher rate than thirteen shillings and twopence per ton.

Table I., at the end of this chapter, shows the quantity of coal sold in each year, from the opening of the mines in 1785 to the close of 1826, when they came into the possession of the General Mining Association; the prices at which the coal was sold, and the rate of royalty per ton when they were worked under lease. Owing to the absence of regular returns in the Record Office, the table is not quite complete, but the shipments in the years 1823-24 and 25, which are missing, probably did not vary much from those of the three years preceding. It will be observed, by reference to the table, that the sales did not increase much until the year 1799, and that they showed but slight improvement from that time up to the end of 1826. Even within those narrow limits the fluctuations were considerable, the sales in one year—as, for instance, in 1805—being sometimes nearly twice as large as in the year preceding. There is every reason to believe that these fluctuations were due, in a great measure, to the quantity of coal stolen in some years from the cliffs, as it was found that, whenever the Government withdrew the cruising vessels, this illicit traffic was carried on to a great extent. Governor Ainslie reported, in February 1819, that, after dispensing with the services of the schooner 'Eclipse,' in the previous year, the quantity of coal stolen from the cliffs exceeded 2,000 tons. It might have been expected that, in the course of forty years, the sales would have reached a higher figure than 10,000 tons, especially since the rapidly growing cities of the United States at that time derived their whole supply of bituminous coal from Great Britain and the Virginia mines,* but it does not appear that more than an occasional cargo was sent from Sydney to New York or Boston. The small demand for Sydney coal in the United States may, however, easily be accounted for on other grounds. The coal was sent to market in such bad condition that it could not find purchasers so long as a plentiful supply of English coal, carefully screened, and even hand-picked, was in the market. At the Sydney mines no pains were taken to separate the large from the small coal; the colliers, who were not skilled workmen, had no inducement to make as much large as possible, being paid at the same rate per chaldron for small as for large; and it was so much tossed about and trampled upon in its way from the pits, subject to not less than four lifts before it was stowed in the ship's hold, that it was little better than mere slack. Under these circumstances it is not surprising that Sydney coal did not sell readily in the United States. The lessees of the mines, it must be admitted, were less to blame for this state of things than the Government, which persisted in granting only short leases at exorbitant rates of royalty. It could not be expected that men of capital would employ their money in an undertaking of magnitude under a lease of five or seven years; and it is equally certain that, without capital, the mines could not be worked with profit. An intelligent foreigner, the Abbe Raynal, in his 'History of the Commerce of the West Indies,' had pointed this out, so far back as the year 1781, when he asserted that nothing but capital was wanted to open the mines of Cape Breton, and make them sources of profit both to the colony and the adventurers, as an advantageous mart would be found in the islands and on the continent of America, where the dearness of wood was already experienced. It will be seen, in the next chapter, that the mines, after struggling through many difficulties, fell at length into the hands of parties provided with ample capital, and that, under the guarantee of a long lease, they have, as foretold by Raynal, proved a source of profit both to the colony and the adventurers. Before we close this chapter the reader, perhaps, will peruse with some interest a short account of the system upon which the works were conducted in the early days of mining in Cape Breton—a system which happily has been long abandoned—as it will enable him to compare it with that which now generally prevails, to the manifest advantage both of the lessees and their employes.

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* The anthracite of Pennsylvania had not, at this period come into use; the first cargo of 365 tons was offered for sale in New York in the year 1820.

The Sydney main seam was first opened in 1785 by driving an adit from the shore near the old whart This adit, as it proceeded along the strike of the seam, drained all the coal lying between high-water level and the outcrop—a belt about one mile in length, with an average width of 200 yards. As the workings advanced from the shore in a westerly direction, new shafts were sunk at intervals of about 200 yards, so that the length of haulage from the faces of the bords to the bottom of the shaft never exceeded that distance. The bords, or rooms, were intended to be six yards wide, separated by pillars of four yards, driven parallel with the adit or level ; but this parallelism was rarely maintained, and it was not unusual to find the bords seven or eight yards, and the pillars only two or three yards, wide. As a natural consequence, the pillars, being too weak to bear the weight of the superincumbent strata, were crushed in and entirely lost ; whereas, if they had been left sufficiently strong, at least three-fourths of the coal which they contained might have been saved. The coal was worked by 'holing' across the bord in the middle, 'sheering' the sides, and breaking it down by wedging. As no separation of large and small was made, the same price being paid for the whole, the colliers had no interest in making as much large coal as possible, so that before it left the face of the bord the proportion of large coal obtained did not amount to two-thirds of the whole.* The coal was hauled in 'two-bushel' tubs, upon small iron-shod sledges, over a roadway formed of round poles two to three inches in diameter, laid transversely, close together, by strong, active young men, who were paid at a certain price per tub. Upon reaching the bottom of the shaft three of these tubs were emptied into a large tub which was raised to the surface, a height of about ninety feet, by a double-horse gin. At the top of the shaft the large tub was emptied into a shoot or hopper, from which the coal was discharged into carts containing twelve bushels. If a vessel happened to be loading at the time, the carts were driven over a rough, shaky road, formed of round poles three or four inches in diameter, laid close together—the 'Corduroy Road' of the colonies—to the wharf, where their contents were discharged into the vessel. When no vessel was loading, and also in winter, when the navigation was closed, the coals were deposited in a large heap near the wharf, over which the carts were dragged. As sometimes 3,000 to 4,000 tons were accumulated in one heap ready for shipment, it may easily be conceived that, after undergoing so many removals, with a final crushing by the horses and carts, the coal was reduced almost wholly to slack before it reached the vessel. Besides, as vessels drawing more than nine or ten feet could not load at the wharf, they had to anchor in the stream, and receive their cargoes from lighters, by which means the coal was still further damaged. Taking all these things into consideration, it is not surprising that Sydney coal could not find a ready market.

All the workmen of the establishment, consisting of overmen, mechanics, colliers, haulers, and labourers, in addition to their wages, whether by the day or by contract, were allowed rations of beef, pork, bread, and molasses, which were given out weekly. If a man was absent from his work, of course he had to pay for his rations; but whether a man worked faithfully or not, he received the same allowances, thus placing the industrious and skilful men on the same level as the idle and ignorant. The working time, both in the pit and on the surface, extended from 5 A. M. to 7 P. M., with an allowance of one hour for breakfast at 9 A. M., and the same for dinner at 1 P. M. All hands being summoned to breakfast by ringing of the bell, abandoned their work and rushed to the store, whence each, having swallowed a glass of raw rum, went to his breakfast. The same process was repeated with regard to dinner, and again at 7 P. M., when the day's work was done. Some of the men were engaged for four, others for twelve months, commencing on January 1. There were only two pay-days in the year—one for four months' men, on May 1, the other for the twelve-months' men, on December 31. As the men, in the meantime, were not furnished with any accounts of their wages or purchases at the store, they generally found, at the final settlement, that, after paying for clothing, stores, rum, &c., they had very small balances to receive. We need not wonder that, under this system, the lessees, as has often been asserted, made more profit by the sale of their stores than of their coal.

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* The workmen were mostly young Irishmen who had been employed in the Newfoundland fisheries. Having earned enough for their purposes, some purchased crown land in Cape Breton, others proceeded to the United States, but very few remained any length of time at the mines. There were, consequently, very few skilled colliers regularly employed at the mines.

All the men, except the two overmen and four mechanics, lived in two barracks or cook-rooms (as they were called), where they took their meals and slept in the same apartments. Their sleeping berths were ranged along the sides of the two rooms in tiers, one above another, as in a ship. It may easily be imagined what sort of a place the cook-room was, where forty men ate, slept, and washed—when they did wash, which was only once a week—in a single apartment. In winter, it is true, they had abundant means of making it warm enough, which is about all that can be said in its favour; in summer it became so very 'lively' that most of the men preferred sleeping during the fine weather under the spruce trees in the vicinity. It could hardly be expected that either harmony or good order prevailed in two rooms occupied by eighty or ninety men under such conditions, where all were upon equal terms and free from restraint.

that he
Mr Brown states
and

Brawling and fighting seemed to be the order, or rather the disorder, of the day, from Monday until Saturday, Sunday being truly a day of rest, which, strange to say, was devoutly observed. The writer, who had the misfortune to occupy a house for more than twelve months about 100 yards from the cook-rooms, can testify that he rarely enjoyed an undisturbed night's rest during the whole of that period.

Neither did the external aspect of the establishment in any way counterbalance its moral deficiencies. No improvements had been made upon the 400 acres of excellent land belonging to the mines; the roads were scarcely passable, and of houses there were none, except the workmen's barracks, half-a-dozen log and sod huts occupied by the overmen and mechanics, a couple of storehouses, and an old framed house,* perfectly innocent of paint, belonging to the managing lessee of the mines. There was neither a school-house nor place of worship, except a small Roman Catholic chapel in the vicinity, where the priest from Sydney officiated once, or perhaps twice, in the course of a year. Such was the dilapidated condition of the Sydney mines when they came into the possession of the present lessees on January 1, 1827. All that had been done was worse than useless, as the property, instead of being improved, was seriously damaged. About seventy-five acres of the main seam had been worked out, leaving the pillars behind, which, owing to the settling of the roof, could not be recovered. To show the wasteful, reckless way in which the works had been conducted, it need only be stated that from seventy-five acres of a six-feet seam, which ought at least to have yielded 500,000, only 275,000 tons had been raised since the mine was commenced in 1785.

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* This house was built over some old workings which had settled down and thrown the floor so far out of level that one side of the sitting-room was two feet below the other. When the Government superintendent of the mines, an old naval officer, used to make his visit of inspection, his first remark generally was: 'Well Mr B., I see you are still carrying top-gallant sails; recollect there is a heavy ground swell; take care you don't come to grief one of these days!

TABLE I Coal sales at Sydney from 1785 *to* 1826, inclusive,

Year	Tons sold.	Selling price per Ton.	Royalty per Ton.	Names of Lessees.	Remarks.
		s. *d.*	*s* *d*		
1785	1668	11 6	Nil	Worked by Gov't	
1786	No return	do.	do	do.	
1787	13351	9 8	do	do.	No separate returns given from 1787 to 1791 inclusive. Average is 2,666 per annum
1788		11 6	Not stated	T. Moxley	
1789		do.	do.	do	
1790		do.	do.	do.	
1791		do.	do.	do.	
1792	2143	Not stated	3 0	Treemain & Stout	
1793	1926	do.	do.	do.	
1794	4405	do.	do.	do.	
1795	5320	do.	do.	do.	Including 911 tons from cliffs do. 995 tons do.
1796	5249	do.	do.	do.	
1797	6039	do.	do.	do.	
1798	5948	do.	do.	do.	
1799	8947	do.	do.	do.	
1800	8401	do.	Nil	Worked by Gov't.	
1801	5775	do.	do.	do.	
1802	7769	10 3	4 0	Wm. Campbell	
1803	6601	do	do.	do.	
1804	5976	do.	Nil	Worked by Gov't	
1805	10131	do.	do.	do.	
1806	4938	do.	do.	do.	
1807	5119	do.	do.	do.	With 365 from cliffs
1808	6616	do.	do.	do.	
1809	8919	do.	do.	do.	With 170 from cliffs
1810	8609	do.	do.	do.	
1811	8516	do.	do.	do.	
1812	9570	do.	do.	do.	
1813	9744	13 2	3 8	Ritchie&Leaver	
1814	9866	do	do.	do.	
1815	9336	do.	do.	do.	
1816	8619	do.	do.	do.	
1817	9284	do.	do.	do.	
1818	7920	do.	do.	G Bown&J.leaver	
1819	8692	do.	do.	do.	
1820	9980	do.	do.	do.	No returns for 1823—4— and 5 Probably averaged about 9,000 tons.
1821	11388	do.	3 6	G. W. Bown	
1822	7512	do.	4 3	T.s.&w.r.bown	
1826	12600	do.	do.	do.	

CHAPTER VII.

OPERATIONS OF THE GENERAL MINING ASSOCIATION IN CAPE BRETON, FROM 1827 TO 1857 INCLUSIVE.

Some few of the readers of these pages may, perhaps, be old enough to recollect that one of the prominent events of the year 1825 was a mania for embarking in mining speculations, and that a number of Joint Stock Companies were formed for working mines of all kinds, but chiefly gold and silver, in North and South America, in the sanguine expectation of realising large profits by their operations. One of these companies, styled the General Mining Association, organised by Messrs. Rundell, Bridge & Rundell, the late well-known firm of jewellers and goldsmiths, purchased, not only extensive mining tracts in Brazil and Colombia, but also a lease of all the mines and minerals of the province of Nova Scotia, which George IV., by an act of the royal prerogative, had granted to his brother, the late Duke of York. Frequent rumours had, from time to time, reached England of the existence of rich veins of copper ore in Nova Scotia, which probably induced the duke to apply for a lease, in the hope thereby of repairing his damaged fortunes. At all events, the duke obtained a lease for sixty years of all the reserved mines, with certain exceptions, which will shortly be specified, and transferred it to Messrs. Rundell, Bridge & Co., upon their agreeing to pay over to him a certain share of the profits which should accrue from year to year. By this prudent arrangement the Duke of York, who had not the means of working the mines on his own account, secured for himself a share of the profits without the risk of incurring any loss whatever.

Having completed their arrangements with the Duke of York in 1825, Messrs. Rundell & Co., or rather the General Mining Association, sent out Mr. Backwell, a Cornish mining engineer, to examine and report upon the veins of copper which, as it turned out, had acquired for Nova Scotia an undeserved reputation for great wealth in that mineral Mr. Backwell spent a summer in examining every known deposit of copper in the province, but did not succeed in finding any worth working. Small pieces of native copper were found in the trap rocks of Cape D'Or, in the Bay of Fundy and some trifling deposits of the grey sulphuret of copper in the sandstones of the coal formation, on the shores of Northumberland Strait, but nowhere in sufficient quantity to make them of economical importance. In the course of his explorations Mr. Backwell collected some useful information concerning the coal-fields of the province, and reported to the Directors of the General Mining Association that, in his opinion, they would do well to abandon their search for copper, and devote their immediate attention to the opening of the coal mines.

Disappointed in their expectation respecting the value of the copper veins, the Directors, acting upon Mr. Backwell's suggestion, in the spring of 1826 sent out the writer of these pages specially to survey and report upon the coal-fields of Nova Scotia and Cape Breton. In the progress of this survey it was found that in the coal-fields of Pictou and Sydney, the best seams of coal in the province were already leased and worked by other parties, and, consequently, they were not included in the Duke of York's lease, which did not cover any mines that were under lease at the time of its ratification. Fortunately for the General Mining Association, Messrs. T. S. & W. R. Bown, whose lease of the Sydney mines would expire on the 31st December, 1826 (see p. 49) were not disposed to renew their tenancy at such a hig, rate of royalty as they hitherto had paid (four shillings and three pence per ton), because nearly all that portion of the seam which was drained by a level was nearly exhausted, and it would be necessary to erect costly pumping machinery. Sir. James Kempt being apprehensive that, under these circumstances, there would be a difficulty in leasing the mines, and that the revenue of the province would suffer accordingly, intimated to the writer, that if the General Mining Association would work the mines 'for one year' on the terms then in force, perhaps, in the course of that time some other arrangement might be made for a longer lease upon more favourable conditions. This offer was readily accepted, and, in consequence, the Sydney mines—beyond all doubt the most valuable in Cape Breton—came into the possession of the General Mining Association on the 1st January 1827.*

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* In the course of the following year the General Mining Association purchased the lease of the Pictou (Albion) mines from the parties who then held them, and thus became exclusive tenants of *all* the

When the Duke of York transferred his lease to the General Mining Association, the latter, of course, became liable for the rents, royalties, &c., under which it was held, and bound to conform to its various stipulations. According to the lease, the royalty payable on coal was one shilling per ton; but when the General Mining Association, in 1828, by agreement with the Provincial Government, obtained a lease of the Sydney and Pictou, or reserved mines, upon which the duke had no claim, terminable in 1886, it was agreed, by all the parties concerned, that the General Mining Association, upon payment of a fixed rent of 3,000*l.* sterling a year, should be allowed to sell 20,000 chaldron, Newcastle measure, in Nova Scotia and Cape Breton, and that they should pay two shillings Halifax currency (equal to one shilling and sevenpence sterling) per Newcastle chaldron upon all the coal sold over that quantity. By this arrangement the rate of royalty paid under the duke's lease was set aside, and an uniform rate established for all the coal raised, whether from mines held under the duke's lease, or from the reserved mines at Pictou and Sydney. This arrangement, however, did not interfere with the terms of the agreement under which the Duke of York, or rather his representatives, were entitled to receive one-fourth of the net profits accruing from the working of the mines. The rents and royalty above specified were paid until the year 1845, when the British Government consented to allow the Association to sell 26,000 instead of 20,000 chaldrons, Newcastle measure, for the fixed rent of 3,000*l.* per annum; but, as a set off-against this privilege, it was stipulated that small coal should also pay royalty, from which, under the former agreement, it had been exempt. This last agreement continued in force until December 31, 1857, when the General Mining Association surrendered their claim to 'all' the mines and minerals except coal within certain defined limits, as will be explained in a future chapter.

Having obtained undisputed possession of all the coal-fields in Cape Breton in 1827, the General Mining Association immediately took the necessary steps for ascertaining the most suitable locality for establishing

mines and minerals belonging to the Crown in Nova Scotia and Cape Breton.

their works upon a large scale. After a careful examination of the qualities and situations of the various seams, it was finally decided that the Sydney 'Six Feet,' or 'Main Seam,' which had been worked by the former lessees, as already stated, was in every respect the most suitable, taking into consideration its superior quality as a domestic fuel, and its situation on the shores of one of the best harbours in North America. As it would take some time to erect machinery, sink shafts, and construct a railway to a convenient place of shipment, it was determined to continue the working of the small portion of the seam still available above water level, which, it was calculated, would, in the meantime, supply about 10,000 tons per annum for two or three years; and, to enable the Association to meet the demand which it was expected would arise in the United States when the coal was shipped in good condition, to open an auxilary colliery, upon a small scale, on the south side of Indian Bay, in the Phelan seam.

The following extracts from a report recently made by Mr. Henry How, Professor of Chemistry, at King's College, Windsor, on the analysis of average samples taken from all parts of the seam, will clearly prove that the high character which the Sydney coal has long enjoyed, both as a domestic fuel and as a steam coal, has been justly acquired :—

COMPOSITION OF AVERAGE SAMPLES OF THE WHOLE SEAM OF COAL.

BY MEDIUM COKING.

Moisture	3·04
Volatile combustible matter	31·14
Fixed carbon	61·50
Ash (reddish brown)	4.32
	100·00
Coke, per cent.	65 82
Theoretical evaporative power	8·46 lbs.

BY FAST COKING.

Total volatile matters	37·48
Coke	62·52
	100·00
Theoretical avaporative power	7·98 lbs

BY SLOW COKING.

Total volatile matters	29·70

Coke	70·30
	100.00
Theoretical evaporative power	9·06 lbs
Mean coke, per cent.	66·21
Mean theoretical evaporative power	8·49 lbs.
Ash, per cent.	4·32
Sulphur, per cent.	1·24
Specific gravity of average samples.	1·30
Calculated weight of one cubic foot, unbroken	81·10 lbs.
" " " broken	54·50 lbs.
Space for one ton, 2,240 lbs., on stowage (economic weight)	41·40 cub. ft.

COMPOSITION OF ASH.

Sand and clay	29·57
Peroxide of iron	51·33
Alumina	4·84
Sulphate of lime	10·98
Lime	3·05
Magnesia	0.23
Phosphoric acid, decided traces	
Manganese, traces	
Chlorine, traces	
	100.00

The details given above explain the well-known high favour in which this coal has been held for upwards of forty years* for domestic use, and also for steam-producing by those who have employed it carefully,

'The mean theoretical evaporative power; or number of pounds of boiling water which should be evaporated by one pound of coal, 8·49, compares very favourably with the actual power of British coals, as found in the Navy Trials in which I assisted; these were :—

Average of	37	samples from	Wales	9·05 lbs.
"	17	"	Newcastle	8·37
"	28	"	Lancashire	7·94
"	8	"	Scotland	7·70
"	8	"	Derbyshire	7·58

This fact alone would always have been significant as indicating that the Sydney coal should prove a good steam coal; but since late experiments have shown that when burnt in proper furnaces, the bituminous coals have been found to give no smoke, and to have an evaporative power even superior to that of Welsh steam-coals, it is now of the highest importance. It is necessary to draw attention in this connection to the resemblance of the Sydney coal to those bituminous coals which gave these results, in containing a low per-centage of ash.'

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* Prof. How's analysis was made in January 1871.

Although rather out of place in chronological order, it may be as well, to avoid the necessity of recurring to the subject, to submit some further remarks on the character of the Sydney coal. It must, however, be borne in mind that the coal which obtained the high character attached to it, was raised from a considerable depth, and shipped in good condition, very different in every respect from that sent to market previous to the year 1827. It possesses many valuable properties as a domestic fuel, igniting readily, burning freely, and making a bright cheerful fire. The ashes are small in quantity, and being comparatively heavy, settle under the grate, thereby leaving a clean tidy hearth in front of the fire. Before anthracite came into such general use in the United States, when bituminous coal was largely imported, it is said to have been a common practice among the coal-dealers to dispose of Sydney coal to their customers under the name of Liverpool orrell—a favourite fuel at that time in New York and Boston. Its good qualities have been long recognised in the British provinces, where it is generally used, and readily sells at from two to three shillings per ton higher than any other provincial coal. It has long been used by the garrison at Halifax, and is the only coal the Commissariat officers will receive in the fuel-yard, though, it is said, they have been urgently pressed, by persons interested in other mines, to accept tenders for their coals at lower rates.

The Sydney coal has maintained a deservedly high reputation as a steam coal ever since it was first used for that purpose, and favourably reported upon by Commander Nott, of her Majesty's steam sloop the 'Dee,' which took in a supply on her voyage from England to Quebec during the Canadian outbreak in 1838. Before the steamers of the Cunard Line discontinued calling at Halifax, about three years ago, they were furnished with supplies of Sydney coal both on their outward and homeward voyages. It is still used by the mail steamers running from Halifax to Bermuda and the West Indies, and also by the French steamers on the Newfoundland station. In 1860 a cargo was shipped direct from Sydney to Brest, for trial by the Director of Naval Construction at that port, who reported to the Minister of Marine 'that in steam power it was little inferior to the Cardiff and quite equal to the Newcastle coal.' The British ships of war engaged in protecting the fisheries, and casual vessels bound to Canada and the West Indies, occasionally touch at Sydney for supplies of coal. Some years ago stores of Sydney coal were deposited in the dockyard at Halifax for the service of ships of war on the North American station, but the practice was discontinued, and Welsh coal was imported to supply its place, because it was alleged that the latter possessed greater evaporative power than the Sydney, in the proportion of 9 to 7; and also that the dense black smoke emitted by Sydney coal during combustion, not only discovered the ship's place to an enemy at a great distance, but also damaged the sails and discoloured the paint. Admitting these objections to be substantial during the time of war, they ought to be disregarded in time of peace, when ships of war can be supplied at Halifax with Sydney coal at thirteen shillings per ton, while, on the contrary, Welsh coal costs at least thirty shillings. But even these objections, trifling as they are, have now been set aside by the introduction of furnaces which consume the smoke; and, as has been proved by a series of experiments made on board her Majesty's steamers 'Urgent' and 'Lucifer,' at Portsmouth, by using equal proportions of Welsh and Newcastle coals, mixed together, a saving of 14½ per cent. is made in the consumption of fuel, and 7½ per cent. gained in the effective horse-power of the engines. Since the Sydney and Newcastle coals are so much alike in their constituents and general characteristics,* a mixture of Sydney and Welsh coal would undoubtedly produce the same results; and it is therefore hoped the

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* It will be seen by comparing the composition of Sydney coal (taking the average of slow, medium, and fast coking) with that of the Hartley, used on board the 'Urgent' and 'Lucifer' in the above trials, that their resemblance is very striking, the slight difference in the excess of fixed carbon in the Sydney being in its favour as a steam coal:—

	Sydney.	Hartley.
Volatile matter, water included. .	33·82	36·16
Fixed carbon	61·86	59.32
Ash	4·32	4.52
	100.00	100 00

Admirality will send out instructions to the officers on the North American station to use it, if not altogether, at any rate mixed with Welsh in equal proportions, to the great relief of British taxpayers.

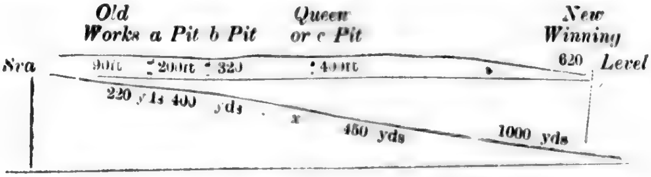
The General Mining Association, as stated at page 58 obtained possession of the Sydney mines in 1826, for one year certain; but, as the arrangement made in 1828 for an extension of the lease was not completed until the following year, no active steps were taken for opening out the works until the beginning of 1830. The first shaft was sunk 250 yards to the dip of the old workings, where it struck the coal-seam at a depth of 200 feet from the surface. An engine of 30 horse-power was also erected for raising coal, and another of 20 horse-power for pumping water. Work-shops, warehouses, and dwelling-houses were also built, and a number of skilled workmen and colliers brought out from England to carry on the works on the most improved system. To supersede horses and carts a light temporary railway was constructed from the pit to the old wharf, pending the completion of a substantial line to a secure place of shipment inside the bar, sheltered from the north-east swell to which the outer harbour is exposed. Small coasting vessels continued to load at the old wharf, but large vessels were loaded by means of schooner lighters, carrying about 60 tons each, at a secure place of shipment some distance up the harbour. To carry on the works with success, and to place them beyond the diasastrous effects of an accident to the steam-engines, an iron foundry, with fitting shops, lathes, and everything necessary for repairing all kinds of mining machinery, was erected on the spot, as there was at that time no place, within a distance of 800 miles, where such repairs could be efficiently made.

As the trade increased it was found necessary, in 1834, to sink another shaft 400 yards farther to the dip. This shaft was 320 feet in depth, and was equipped with a pumping engine of 80 and a winding engine of 30 horse-power. During the same year the railway, three miles in length, was completed from the pits to North Sydney where vessels of large burden have ever since received their cargoes with safety and despatch direct from the pit.

This pit (the 'b') continued to supply the demand until 1854, when, owing to heavy influx of water, which overpowered the pumping engine, it was abandoned, and the Queen or 'c' pit, which had been previously sunk and equipped in anticipation of such a misfortune, was brought into operation. All the pillars had, before this happened, been taken out of the 'a' pit, but there was a considerable portion still remaining in the 'b' pit when it was lost. The great body of water in the 'b' pit workings is effectually prevented from communicating with those to the dip by a barrier rib of solid coal 150 feet in width.

The Queen, or 'c' pit, is 400 feet in depth. It is worked by a pumping engine of 150 and a winding engine of 60 horse-power. All the whole coal has been worked to the rise of the shaft, except a few acres near the harbour shore. The greatest part, also, of the whole coal, to the extent of 1,000 yards to the dip of the shaft, has been worked; from this part of the mine the coal is drawn up inclined planes by two underground engines, of 30 horse-power each, supplied with steam by boilers on the surface. A portion of the pillars has been worked in this part of the mine; in the course of a few years the whole will be removed, and at the same time, probably, some of those now under water in the 'b' pit will be recovered. All the coal now shipped from the Sydney mines is raised from the Queen pit, which is capable of supplying 150,000 tons per annom. It is conveyed by railway to the shipping wharves at North Sydney.

Locomotives were first employed in 1854, horses having been previously used in hauling the coal. The annexed diagram shows the position and depth of the several shafts sunk at the Sydney mines since 1827 in section:—



The new shafts now in progress of sinking at the 'new winning,' 1,000 yards farther to the dip, will be described in a future chapter when the operations subsequent to the year 1857 claim our attention.

The Lloyd's Cove and Indian Cove seams were worked by the French for the supply of Louisbourg, and subsequently by the British Government for the use of the troops at Halifax. They have also been worked by the General Mining Association to a small extent, but, owing to their inferior quality, have been some time abandoned.

The Bridgeport mines, situated on the southern shore of Indian Bay, were first opened by the General Mining Association in 1830, when a level was driven from the outcrop along the strike of the seam, now known as the 'Phelan seam.' As the level proceeded to the southward pits were sunk at intervals of about a quarter of a mile, from which the coal was raised by horse-gins. At the face of the cliff the seam consisted of an upper bed, three feet in thickness, and a lower bed, five feet three inches in thickness, separated by a four-inch layer of shale ; but, as the level advanced, the layer of shale gradually increased, until, at the distance of half-a-mile from the shore, it attained a thickness of twenty-eight feet. Beyond this point it rapidly declined, and at a trial bore-hole, 300 yards to the dip of the level, it was found to be only fourteen inches thick, the upper bed of coal being three feet and a half and the lower six feet in thickness. In the first instance the coal was brought out of the level and boated off to vessels at anchor in the open bay, but in 1833 a light railway, two miles in length, was laid from the pit along the sand-beach to the harbour, which was adapted only for vessels drawing eleven feet of water when loaded. The Bridgeport is a good domestic fuel, but not equal to the Sydney coal ; on the other hand it is more valuable as a gas-coal, yielding nearly 10,000 cubic feet of gas per ton. Its constituents by analysis are :—

Volatile matter	33·20
Fixed carbon	61·39
Ash	5·41
	100.00

Owing to a great decline in the demand for this coal in 1841 and 1842 the mine was closed in the latter year, but the whole of the coal on the banks was not disposed of for some time afterwards. The railway materials and moveable plant were transferred to the Sydney mines.

The Lingan mines, situated on the northern shore of Indian Bay, were first opened by the General Mining Association in 1855, when it was expected that, owing to the removal of the duty upon coal in the United States under the provisions of the Reciprocity Treaty, a considerable demand would arise for Lingan coal, which had been found very suitable for the manufacture of gas. Its superior quality as a smith's coal had long been known, and, as the seam cropped out in the face of the cliff in a conspicuous position, it had attracted the attention of the coal smugglers at a very early period. The seam, marked No. 6 in the tabular section, p. 23, is eight feet six inches in thickness, and is supposed to be a continuation of the Bridgeport or Phelan seam. The colliery was first opened by driving an adit from the shore on the strike of the seam, a distance of about half-a-mile, when it was intersected by a slope driven from the outcrop of the coal, where an engine of 30 horse-power was erected for drawing the coal up the slope and pumping the water from the workings to the dip of the adit. The seam has been worked on both sides of the slope, which has recently been continued downwards under the sea, where the best coal is found, in quantity practically illimitable. The coal is conveyed by railway, something less than a mile in length, to the harbour, which is navigable by vessels drawing fourteen feet of water. The Lingan coal has been used to a considerable extent in the United States for gas manufacture. According to the report of the engineer of the New York Gas Company, it yields 9,600 cubic feet of gas per ton. The annexed extracts from an analysis recently made by Professor How, of King's College, Nova Scotia, will show that it is equally well adapted for other useful purposes :—

BY MEDIUM COKING.

Moisture	3·17
Volatile combustible matter	26·86
Fixed Carbon	66·91
Ash	3·06
	100·00
Theoretical evaporative power.	9·07 lbs.

BY SLOW COKING

Total volatile matters	25·43

Coke	74·57	
	100·00	
Theoretical evaporative power	9·81	lbs.

By Fast Coking.

Total volatile matters	33·70	
Coke	66·30	
	100·00	
Theoretical evaporative power	8·71	lbs.
Mean theoretical evaporative power	9·19	lbs.
Prejudicial sulphur per cent.	·710	
Specific gravity "	1·282	
Weight of one cubic foot, unbroken	79·95	lbs.
" " broken	53·56	,,
Economic weight, or space for stowage of one ton of 2,240 lbs.	41·81	cubic feet

On these results Professor How remarks that the Lingan is an excellent gas-coal, owing to its low amount of sulphur, ninety-eight British coals, tried in the Navy Enquiry, having yielded an average of 1.25 per cent. For the same reason, he adds, taking into account also the excellent quality of the coke, the Lingan should prove a valuable coal for blacksmith's uses and for smelting.

It will be seen from the following extracts from Prof. How's report that the Lingan possesses all the most important qualities requisite to establish its character as a good steam-coal :—'The ash is very low in all parts of the seam, the average of the whole being only 3·06 per cent. This gives great evaporative power to the coal, and hence, according to late results, it should be valuable for steam purposes. The mean of all my experiments gives for the theoretical evaporative power of the coal 9.19 lbs. as the amount of boiling water which should be evaporated by one pound of coal. This is somewhat above the practical result, even from Welsh steam-coals, in our British Navy steam trials, which gave the highest weight, viz. 9·05 lbs. As it is now known that bituminous coal can be made to give, without smoke, greater heating power than Welsh steam-coals, when their ash is low, a bituminous coal like this of Lingan assumes a new value.' . . . 'I find that the average percentage of ash from fourteen analyses of North of England coals is 3·77. while the Lingan gives only 3.06 per cent., so that in proper furnaces it ought to prove a very good steam-coal indeed.' . . . 'The analysis of the ashes leads me to conclude that, except, perhaps, in the case of that of the bottom coal [one-third of the thickness of the seam], there will not be much clinker formed, as in the other parts of the seam the sulphate of lime and lime bear too small a proportion to the other ingredients, of which a considerable amount is clay ; this is especially the case with the middle coal, so that, even when the coal is used altogether, there will probably be little clinker, and the ash will be readily cleaned from the furnace.'

'The Bras d'Or Mine,' situated on the southern shore of the little entrance of the Bras d'Or, about four miles from the sea, was opened by the General Mining Association in 1833, upon a small scale, by driving a level from the water's edge along the strike of the seam. This seam, which is probably a continuation of the "stony seam" of the Sydney mines section, is five feet in thickness, dipping easterly at an angle of six degrees. It was worked for three or four years, but, owing to its inferior quality, it was impossible to effect a sale at a remunerative price, and was, consequently, abandoned. About 9,000 tons altogether were raised, but it was not all disposed of until 1855, though sold at a merely nominal rate. Being outside the limits of the General Mining Association's reservations, under the arrangement made with the Government in 1857, which will shortly come under consideration, it has since been re-opened and worked by another party, as will be explained in its proper place.

'The Point Aconi Mine,' near the little entrance of the Bras d'Or, on the island of Boulardrie, was opened upon a small scale in 1857, for the purpose of obtaining a few cargoes for trial as a gas-coal, but the results were not encouraging, and the works were abandoned. The seam, known as the 'Stubbert seam' (see Boulardrie section,) is seven feet in thickness and is of good quality for domestic purposes.

See Appendix.

CHAPTER VIII.

The chief object of the General Mining Association in opening the coal mines of Cape Breton was to establish an extensive trade with the United States, which at that time derived their principal supplies of bituminous coal from England. It was not expected that the British provinces, where wood was abundant and cheap, would be large consumers; but the result has proved otherwise, as the reader will learn by an inspection of Tables II., III., and IV. at the end of this chapter. These tables, containing the particulars of thirty-one years' experience in the trade, will place the subject before the reader in a more intelligible shape than many pages of explanations, and enable him to draw his own conclusions. Table II., giving the selling price at each mine, the rent and royalty paid to the Government, the import duty in the United States, and the reductions in these several items from time to time, will, by comparison with Table III., showing the annual sales, exhibit the general effect of those reductions; while Table IV. will prove that the principal increase in the sales was due, specially, to the rapidly growing demand for Cape Breton coal in the British provinces.

It must, undoubtedly, have been a great disappointment to the General Mining Association to find in 1857 that, after a struggle of thirty years, in which neither trouble nor expense was spared, the sale of Cape Breton coal had made such little progress in the United States; it may, however, be some satisfaction to the present proprietors to know that the want of success in that direction was owing to circumstances entirely beyond the control of the Association or their agents in the United States. The following remarks will prove this assertion. In the first place, when the Association began to work the Sydney mines in 1827, commercial intercourse between the United States and the British provinces was hampered by so many restrictions, that it was impossible to deliver Cape Breton coal in New York or Boston at a price that would command the market. In addition to an import duty of six shillings and ninepence per ton upon the coal (Table II.), colonial vessels entering ports of the United States were subject to a duty of four shillings per ton upon their registered tonnage, and United States vessels were liable to a similar duty trading to colonial ports. Besides, as Halifax was the only free port in Nova Scotia, British vessels trading at the mines could not proceed direct to the United States, but were obliged to touch at Halifax to clear out for their destination; whilst American vessels, on the other hand, could not enter any port in the province except Halifax, unless driven in by stress of weather for shelter. In the course of the following year, however, the tonnage dues were abolished by both countries, and the ports of Sydney and Bridgeport were opened to foreign vessels, through the influence of the directors of the Association in England.

These restrictions were, however, scarcely removed when another obstacle of a more serious nature arose to the Cape Breton coal trade. Wood was so generally used as fuel in the United States in 1827, that the consumption of coal in Boston and New York only amounted in that year to 173,428 tons, of which Great Britain supplied 34,647, Virginia 79,214, and Pennsylvania 58,567 tons. As the demand for coal was rapidly increasing, and wood was becoming scarcer and dearer, there appeared to be a favourable opening for the introduction of a large quantity of foreign coal; but, unfortunately for the Cape Breton mines, just at this juncture the anthracite coal of Pennsylvania, which had hitherto reached the markets on the sea-board in very small quantities, obtained an outlet to the ocean by means of the Schuylkill navigation, which was opened in 1825. This canal, 108 miles in length, formed an uninterrupted communication between Pottsville, the centre of the anthracite region, and the port of Philadelphia, from whence the coal was shipped, at moderate rates of freight, direct to Boston and New York, where, of course, it was delivered free of duty, and came into competition with Cape Breton coal, burdened with an import duty of six shillings and ninepence per ton. Although objectionable in some points, the anthracite, when it became well known and the mode of using it understood, was found to be superior to bituminous coal on account of its cleanliness, durability, and freedom from smoke. Consequently it soon came into general use, and established a character which it has ever since maintained, notwithstanding the reduction of the duty on foreign coals and their lower cost. In 1847, after twenty years' experience, anthracite sold readily in Boston at six dollars, whilst Sydney could hardly be disposed of at five dollars and a half per ton. In the same year the sales of anthracite amounted to 2,982,309, whilst Sydney only reached 23,539 tons.

It might be supposed, from the amount of shipments to the United States between the year 1830 and 1833 inclusive, as shown in Table IV., that there was a marked increase in the demand; but that was not the fact, for the Association shipped the greater portion of the coal that went to the United States on consignment to their agents, with instructions to sell at such prices as it would bring—prices which, it need scarcely be added, seldom covered cost and charges. This practice was discontinued in the two following years, but, unfortunately, was resumed in 1836-37 and 38 under a still more objectionable form, large quantities of coal having been shipped and yarded in depots at New York at a heavy cost. It may easily be imagined that, so long as a large stock of coal was kept in store, it was impossible for the regular traders to sell their cargoes direct from the ship. These were driven out of the business, while, on the other hand, the Association were unable to sell from their depot at a remunerating price subject to such heavy charges for wharfage, yarding, rent, and agencies. The coal, in consequence, after remaining a long time on hand and suffering much deterioration from exposure to the weather, was obliged to be sold at 'an alarming sacrifice.'

It will be seen by Table IV. that a large quantity of coal was sold in 1839—namely, 45,356 tons. This large exceptional shipment occurred under a contract with a colonial firm, which undertook to sell 30,000 tons upon condition of being supplied at a rate considerably under the regular selling price. Neither the Association nor the contractors made any profit by this transaction.

Notwithstanding a reduction of four shillings per ton in the duty in 1847, and its total abolition in 1857 under the provisions of the Reciprocity Treaty, the exports to the United States continued to decline, the average sales during that period having reached only 15,400 tons per annum. Indeed, this low average even would not have been reached if the sales had been confined to Sydney coal; it was only brought up to that amount by the introduction of Lingan coal in 1855 for the use of the gas-works. It will thus be seen that neither reduced selling prices nor its admission duty free could secure for Sydney coal a market in the United States in competition with their own anthracite, which had now come into general use for domestic purposes.*

The loss of the American market has, happily, been compensated for, in a great measure, by the gradual and steadily increasing demand in the British provinces. In the early years of their settlement, when wood was plentiful at every man's door, we have seen (Table I.) that the use of Sydney coal was confined to the town and garrison of Halifax, and that the average sales from 1785 to 1826 only amounted to 5,600 tons per annum. As wood became scarce the sales would naturally have increased had they not been checked by the high price at the mines, which, up to 1826, was seldom under thirteen shillings per ton. As the same price was maintained up to the year 1833, notwithstanding a considerable increase in the population, the average sales did not exceed 10,000 tons per annum. When, however, the selling price was reduced in 1834, the sales in that and the five subsequent years averaged 25,000 tons per annum. Again, when a further reduction of price was made in 1839, the sales began to increase rapidly until the year 1857—the limit of the period under consideration—when they reached 98,300 tons per annum. These results are too palpable to be overlooked. They plainly show that the General Mining Association must look chiefly to the British provinces for a market for their Sydney coal, where its character is well known and appreciated, and that they will find it to their interest to foster the trade by selling at low prices to regular customers, thereby securing a fair profit on their outlay, perfectly free from the fluctuations, and consequent losses, attendant upon a foreign trade, liable at any moment to be suspended by a hostile tariff.

It formerly was the custom, as has been already mentioned, to ship the large and small coal together, charging the same price for the whole; but the General Mining Association soon found that coal shipped in this condition could not be sold in the United States, where it had to compete with English coal carefully screened, and even hand-picked specially for the New York market. The practice was, therefore, discontinued in 1831, when the small coal was offered for sale at half price; as this reduction was not sufficient to create a demand, it was further lowered in 1837 to three shillings and fivepence per ton, being one-third of that of large coal. Since that time it will be observed, by reference to Table IV., the sale of this description of coal has been gradually increasing both in the United States and the colonies. In the former it is chiefly used in the furnaces of steam-engines employed in manufactories, as its facility of ignition and very low price enable it to compete successfully with anthracite. In the colonies it is used for lime-burning, and also in common fires mixed with wood, by farmers and persons who cannot afford to purchase large coal.

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* The quantity of anthracite raised in the United States in 1870 amounted to 15,723,030 tons.

TABLE II.—Mines. Selling Prices, Rent and Royalty, and United States Duty per Ton from 1827 to 1857, inclusive.

Year	Selling prices per Ton										Crown Rent and Royalty per Ton	United States Duty per ton	Remarks
	Sydney		Bridgeport		Bras d'Or		Lingan		Pt. Aconi				
	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small			
	s d	s d	s d	s d	s d	s d	s d	s d	s	d	s d	s d	
1827	13 2	—	—	—	—	—	—	—	—	—	4 3	6 9	Duty imposed by Congress on April 27, 1824
1828	do.	—	—	—	—	—	—	—	—	—	do.	do.	
1829	do.	—	—	—	—	—	—	—	—	—	2 9¼	do.	
1830	do.	—	13 2	—	—	—	—	—	—	—	2 3	do.	
1831	do.	—	11 5	—	—	—	—	—	—	—	1 8	do.	
1832	do.	6 7	do.	—	—	—	—	—	—	—	1 2¼	do.	
1833	do.	do.	do.	—	13 2	—	—	—	—	—	1 0¾	5 6	By Compromise Act of Congress of 1833
1834	11 5	5 8	10 10	3 5	11 5	—	—	—	—	—	1 2¼	do	
1835	9 7	3 5	9 2	do.	9 7	—	—	—	—	—	1 1	do.	
1836	do.	do.	do.	do.	do.	—	—	—	—	—	0 11¼	do.	
1837	10 10	do.	10 3	do.	10 3	3 5	—	—	—	—	0 10	do.	
1838	do.	do.	do.	do.	do.	do.	—	—	—	—	0 10½	do.	
1839	10 3	do.	do.	do.	do.	do	—	—	—	—	0 9¼	do.	
1840	do.	do.	9 2	do.	do.	do.	—	—	—	—	0 10¼	do.	
1841	do.	do.	do.	do.	do.	do.	—	—	—	—	0 9	do	
1842	do.	do.	do.	do.	do.	do.	—	—	—	—	0 9¾	7 0	By Act of Congress of August 30, 1842
1843	do.	do.	do.	do.	do.	do.	—	—	—	—	0 11¼	do.	
1844	do.	do.	do.	do.	do.	do.	—	—	—	—	0 10¼	do.	
1845	do.	do.	do.	do.	—	3 0	—	—	—	—	0 9½	do	
1846	do.	do.	do.	do.	—	do.	—	—	—	—	0 8½	do	
1847	do.	do.	do.	do.	—	do.	—	—	—	—	0 8	3 0	By Act of Congress of December 1, 1846
1848	do.	do.	do.	do.	—	do.	—	—	—	—	do.	do.	
1849	do.	do.	do.	do,	—	do.	—	—	—	—	0 8¼	do.	
1850	do.	do.	—	do.	—	do.	—	—	—	—	0 8	do.	
1851	do.	do.	—	—	—	—	—	—	—	—	0 8¼	do.	
1852	do.	do.	—	—	—	3 [illegible]	—	—	—	—	0 8	do.	
1853	do.	do.	—	—	—	do.	—	—	—	—	0 7¾	do.	
1854	do.	do.	—	—	—	—	10 8	—	—	—	do	do.	
1855	do.	do.	—	—	—	—	do.	3 9		3 0	do.	Free	Under Treaty of Reciprocity
1856	do.	do.	—	—	—	—	do.	do.		do.	do.	do.	
1857	do.	do.	—	—	—	—	10 0	3 5		do.	0 7½	do.	

NOTE.—In estimating the Rent and royalty, the sales of the Pictou and Joggins mines had to be taken into account, as the fixed rent of 3,000*l*, per annum under the agreement of 1828, covered a portion of the sales at those mines

TABLE III.—Quantity of Coal sold, in Tons, at the Sydney, Bridgeport, Bras d'Or, Lingan, and Point Aconi Mines from 1827 to 1857, inclusive.

Year	Sydney		Bridgeport		Bras d'Or		Lingan		Pt. Aconi		Totals	
	large	small	large	small	large	small	large	small	large	small	large	small
1827	12037	—	—	—	—	—	—	—	—	—	12037	—
1828	14375	—	—	—	—	—	—	—	—	—	14375	—
1829	13863	—	—	—	—	—	—	—	—	—	13863	—
1830	16665	—	1621	—	—	—	—	—	—	—	18286	—
1831	20896	—	4287	—	—	—	—	—	—	—	25183	--
1832	27736	201	4827	—	—	—	—	—	—	—	32563	201
1833	19815	185	15252	—	1417	—	—	—	—	—	36484	185
1834	16223	29	13499	17	171	—	—	—	—	—	29983	46
1835	20905	70	9976	17	64	—	—	—	—	—	30945	87
1836	43064	248	11555	84	131	—	—	—	—	—	54750	332
1837	47407	1108	17063	257	1965	8	—	—	—	—	66435	1373
1838	38628	608	17582	627	369	33	—	—	—	—	56579	1268
1839	60920	431	17469	686	19	67	—	—	—	—	78408	1184
1840	51148	1237	16854	1097	42	47	—	—	—	—	63044	2381
1841	66595	1669	12124	442	25	46	—	—	—	—	78744	2157
1842	67888	2212	5717	652	173	68	—	—	—	—	73778	2932
1843	65582	2349	--	126	98	54	—	—	—	—	65680	2529
1844	63843	1851	—	148	89	39	—	—	—	—	63932	2038
1845	67825	4642	2279	227	—	1535	—	—	—	—	70104	6404
1846	60027	3708	207	134	—	764	—	—	—	—	60234	4606
1847	72971	4853	190	165	—	535	—	—	—	—	73161	5553
1848	70417	4089	115	175	—	570	—	—	—	—	70532	4834
1849	69869	4281	19	129	—	560	—	—	—	—	69888	4970
1850	67844	5651	—	25	—	75	—	—	—	—	67844	5751
1851	64131	5231	—	—	—	—	—	—	—	—	64131	5231
1852	73885	5125	—	—	—	53	—	—	—	—	73885	5178
1853	72696	4516	—	—	—	14	—	—	—	—	72696	4530
1854	93178	5815	—	—	—	—	322	11	—	—	93500	5826
1855	82269	6182	—	—	—	—	4472	560	—	59	86741	6801
1856	94777	6714	—	—	—	—	8801	367	98	156	103676	7237
1857	10743)	8641	—	--	—	—	9537	341	451	149	117418	9131

TABLE IV.—Quantity of Cape Breton Coal Sold, in Tons in Nova Scotia and Cape Breton, the neighbouring Colonies, and the United States from 1827 to 1857 inclusive.

Year.	Nova Scotia and Cape Breton.		Neighbouring Colonies		United States		Totals	
	Large.	Small	Large	Small	Large	Small	Large	Small
1827	11738	—	299	—	—	—	12073	—
1828	11910	—	997	—	1468	—	14375	—
1829	9132	—	1832	—	2899	—	13863	—
1830	8812	—	1112	—	8362	—	18286	—
1831	7493	—	735	—	16955	—	25183	—
1832	5328	201	2769	—	24466	—	32563	201
1833	9912	185	3587	—	22985	—	36484	185
1834	18975	46	4437	—	6481	—	29893	46
1835	13080	37	6388	—	11477	50	30945	87
1836	12039	165	9352	—	33359	167	54750	332
1837	13699	38	17217	372	35519	963	66435	1373
1838	19198	360	11086	82	26295	826	56579	1268
1839	19637	235	13415	—	45356	949	78408	1184
1840	23489	1232	11757	123	27798	1026	63044	2381
1841	30915	536	16276	243	31553	1378	78744	2157
1842	28610	1706	28221	280	16947	946	73778	2932
1843	27575	960	19734	453	18371	625	65680	2529
1844	24189	1346	22327	412	17416	280	63932	2038
1845	21185	2847	24724	1976	24915	1580	70104	6404
1846	26327	2585	21106	1069	12801	952	60234	4606
1847	26897	2579	22725	1865	23539	1109	73161	5553
1848	31938	2085	22595	1870	15999	879	70532	4834
1849	33004	2582	19958	694	16926	1694	69888	4970
1850	27505	2168	25225	1363	15114	2220	67844	5751
1851	30084	1628	23256	442	10791	3161	64131	5231
1852	33756	1964	28988	613	12141	2601	73885	5178
1853	24413	2002	37100	742	11183	1786	72696	4530
1854	33134	2572	40961	535	19405	2719	93500	5826
1855	33370	2416	36282	333	17088	4052	86741	6801
1856	45678	2847	40938	182	17060	4208	103676	7237
1857	40570	2704	57794	213	19054	6214	117418	9131

CHAPTER IX

Having now brought down our narrative to the year 1858—a most important epoch in the history of the coal trade—it will be necessary, in order to place the subject clearly before the reader, to revert to some transactions which have already been noticed in a previous chapter. It will be recollected that, although the Sydney mines had been worked ever since the establishment of a separate government in the island in 1783, no sensible progress had been made in the trade up to the year 1820, when Cape Breton was annexed to the Government of Nova Scotia. During the next six years no improvement took place ; and, when the lease of the Messrs. Bowns expired in 1826, the Governor, Sir James Kempt, could not find any parties in Nova Scotia disposed to take the mines, though men possessed of ample means were not wanting These, however, had their capital employed in other pursuits, and were unwilling to embark in mining speculations, with which they were entirely unacquainted. Under these circumstances the reserved mines of Sydney and Pictou, as has already been related, fell into the hands of the General Mining Association. When it first became known in the province, in 1826, that a lease of the mines had been granted to the Duke of York, by whom they had been sublet to a rich English company prepared to work them on a large scale, the intelligence was received with great satisfaction by the colonists, who justly anticipated that the prosperity of the country would be increased, and the revenue proportionably augmented, by their operations. Not a word was then uttered against the Duke of York's lease, nor against the transfer of the reserved mines to the Association in the following year.

The experience of a few years amply verified the favourable anticipations of the colonists. The expenditure of £300,000 previous to the year 1846, in a colony containing not more than 250,000 inhabitants, in sinking pits, constructing railways and wharves, building houses, erecting machinery, and in opening a foreign trade, was sensibly felt throughout the length and breadth of the land. The farmers obtained a good market for their produce, the merchants a ready sale for their importations, hundreds of the people constant employment at good wages, and the commercial marine lucrative freights. The benefits conferred upon the province by the operations of the General Mining Association were fully acknowledged by a committee of the House of Assembly, appointed in the session of 1839 to investigate a matter connected with the Pictou mines, which, among other things, reported 'that the operations of the Mining Association had been highly advantageous to the province by the introduction of science and skill, by the erection of machinery, by the creation of a foreign trade in coals, and by the annual expenditure of upwards of 50,000*l*. in the midst of a population employed in agricultural pursuits; and that it was the duty of the Legislature to favour and encourage the introduction and employment of capital, and the protection of those who were largely extending the trade and developing the resources of the province from unnesessary interruption and annoyance.' Five out of six of the members composing this committee were leading men of the Liberal party, who, though they cheerfully recognised the benefit derived by the country from the operations of the Association, had frequently expressed their dissatisfaction on the floors of the Assembly with the Duke of York's lease, and, on more than one occasion, had called its legality in question. On a subsequent occasion one of the members, who took an active part in the discussion of the question, asserted that all the coal-fields of the province had been granted to strangers, thus creating a monopoly of vital importance for domestic uses and for mechanical and manufacturing purposes; that the monopoly included all mines and minerals of every kind; that the development of the provincial resources was prevented; that the allowance paid to the Duke of York's representatives was a clog on the industry of the province,* a tax on its fuel, and an export duty on coal sent abroad; that the proprietor of the soil only owned the material on which he exercised agricultural pursuits, and nothing beneath belonged to him, whereas Canadian grants reserved only gold and silver. It was admitted that the Association had exercised their rights with great forbearance, but then, it was argued, they had the power at any time of withdrawing the privileges which the owners of the soil enjoyed only on sufferance.

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* If this referred to the share of the profits payable to the Duke of York, it was no clog to the industry of the province, but a serious tax on the profits of the General Mining Association.

It cannot be denied that, on principles of common justice and national policy, the House of Assembly had good reason for expressing, as they did in 1845, their opinion that the lease to the Duke of York 'was improvident and unconstitutional.' But if it was 'improvident and unconstitutional' in 1845 it was equally so in 1827, when the Association began to expend their money in the provinces; and they ought, in common fairness, to have been candidly told that their rights would be disputed, and should not have been allowed to invest a capital of 300,000*l*. in the country without fair warning, and then find themselves denounced as monopolists and oppressors of the poor by the very people who, up to that time, had alone profited by their vast expenditure. Having challenged the rights of the Association to the mines of the province, the House of Assembly, in the session of 1845, passed a resolution authorising the Executive to take the opinion of counsel in England upon the legality of the Duke of York's lease. In accordance with this resolution a case was prepared and submitted to three eminent lawyers in England, who unanimously gave their opinion in favour of the legality of the title of the General Mining Association.

Though candidly told by their own counsel that the claims of the Association could not be set aside, and informed officially by Lord Stanley in 1844, and by Lord Grey in 1849, that the British Government was determined to uphold the rights of the Association, the question was debated with considerable warmth on the floors of the Assembly in every succeeding session up to that of 1852. Finding that all their debates amounted to nothing, the House of Assembly gave up the idea of upsetting the Association's claims, and prudently resolved to adopt a more pacific course, which, as will shortly be seen, soon produced beneficial results, and gave to the Provincial Government the possession and control of nearly all the mines and minerals of the country. In the sessions of 1852, 1854, and 1855 resolutions were passed authorising the Governor and Council to open negotiations with the General Mining Association for the purpose of ascertaining upon what terms the latter would agree to surrender their claims to all the mines except those they were working; but the Association, though well disposed to enter into some satisfactory arrangement with the Provincial Government, were not in a position to negotiate for the purpose, on account of a lawsuit then pending in the Court of Chancery with the Duke of York's executors. In the following year, however, this suit having been settled, the House of Assembly passed an address offering to confirm the Association in the undisputed possession of all the coal-mines they had opened, to increase the areas of their operations to any reasonable extent they might desire, and to reduce the royalty to one-half of its amount, provided the Association would surrender their exclusive right or claim to all the other mines and minerals in the province. At the same time a resolution was passed requesting the Executive Government to take proper steps for effecting a settlement of this vexed question. In accordance with this resolution proposals were made to send delegates from Nova Scotia to confer with the directors of the General Mining Association, which were readily agreed to, as the Association were equally desirous of closing an irritating controversy, which had been detrimental to their interests, and which, if persisted in, might lead to further embarassing and more serious complications. Having thus secured the assent of the Association to the proposed conference, the following resolution, in the session of 1857, was submitted by the Attorney-General and adopted by the House of Assembly:—'That, if the Provincial Government shall find it necessary, for effecting a satisfactory compromise of this question, to employ commissioners, this House does authorise the selection by the Provincial government of two members, prominently representing the different views held in this House on the subject, who shall have power to effect a settlement of the controversy, provided both of the commissioners shall agree thereto, subject to the ratification of the Legislature, and this House will provide for the expense.'

In conformity with this resolution Mr. Johnston, the Attorney-General of Nova Scotia, and Mr. Archibald, a prominent member of the Opposition, were sent to England in the month of June 1857. Upon their arrival in London they immediately entered upon the duties of their important mission, and had frequent interviews with a committee appointed by the directors of the General Mining Association. According to their own testimony, as stated to the House of Assembly. the delegates were met, upon all occasions, with the utmost frankness and consideration by the directors' committee, and every question was discussed in all its bearings in a friendly spirit, both parties being anxious to come to a fair and satisfactory settlement. Governed by such motives, their endeavours were happily crowned with success, though, as may easily be conceived, serious difficulties had to be surmounted in reconciling and satisfying the conflicting claims of the 'four' parties interested in the question ; namely, the Crown, the Duke of York's representatives, the province of Nova Scotia, and the General Mining Association. To arrive at a satisfactory settlement or compromise, each of these parties agreed to make certain concessions upon condition of receiving corresponding privileges, which, it was hoped, would in the end prove beneficial to their respective interests.

1. The Crown, it will be remembered, by the original lease to the Duke of York, was entitled to a royalty of one shilling per ton upon coal ; but, when the agreement was made, in 1828, to lease the reserved mines to the General Mining Association, it was stipulated that the Crown should surrender its claim to the royalty payable by the Duke of York, and that the Association should pay a fixed rent of 3,000*l.* per annum and a royalty of two shillings Halifax currency, or one shilling and seven-pence sterling, upon all coal sold above 20,000 chaldrons, Newcastle measure. Upon the faith of this agreement the Association invested a large capital in opening the mines ; but unfortunately, owing to some legal difficulties connected with the Duke of York's affairs, the agreement was never duly signed and executed. The rent and royalty accruing under the agreement was devoted by the Crown to the payment of the salaries of the officers on the civil establishment of Nova Scotia; but when the Crown, in 1849, inadvertently conveyed to the Government of the province all its interest in the mines, in consideration of an understanding on the part of the latter to pay the civil list,

without making due provision for the execution of the agreement of 1828, it was found that the Crown, as advised by its legal officers, would be responsible to the General Mining Association for damages in case the Assembly of Nova Scotia should refuse to complete it. To escape from this awkward dilemma, when the Nova Scotia delegates and the Mining Association agreed upon the terms of a settlement, the Crown readily gave its assent ; and, as a contribution towards an arrangement which relieved it from further responsibility, willingly consented to give up its claim to the sum of 30,000*l*. due by the estate of the Duke of York.

2. During the long-pending suit in Chancery relative to the estate of the Duke of York, the profits due to the Duke's representatives, which had been suffered to accumulate, amounted in 1857 to about 54,000l. In order to remove all obstacles in the negotiations with the Nova Scotia delegates, the Mining Association agreed to pay the Duke's representatives the sum of 46,000*l*., in addition to the 54,000*l*. above mentioned, upon the condition of their resigning all their claims to any portion of the profits during the remainder of the lease. By this arrangement matters were greatly simplified, two parties only—the Government of Nova Scotia and the Mining Association—being then interested in the settlement of the question.

3. The Government of Nova Scotia, in consideration of obtaining the surrender of the Associations's claims to all the mines and minerals of the province except those enumerated in the next paragraph, agreed to abolish the fixed rent of 3,000*l*. per annum and the royalty on small coal hitherto paid by the Association ; to reduce the royalty on large coal to fourpence and eight-tenths of a penny per ton upon all coal sold up to 250,000 tons ; to reduce the royalty to threepence and two-tenths of a penny per ton upon all coal sold over 250,000 tons ; to guarantee that no export duty should be imposed upon coal shipped by the Association to foreign countries ; and to confirm the Association in undisturbed possession of all the mines they had opened during the remainder of their lease.

4. In addition to the privileges mentioned in the last paragraph, and in consideration of their surrender of their claims to other mines and minerals, the General Mining Association, by the terms of this new

arrangement, secured an exclusive right to all the coal-seams in the island of eighteen square miles, bounded on the east by Sydney Harbour, on the west by the Great Entrance of the Bras d'Or lakes, on the north by the sea-coast from Cranberry Head to Point Aconi, and on the south by a straight line drawn from Stubbert's Point, in Sydney Harbour, to the head of Mill Creek, on the west shore of Boulardrie Island: in a tract of fourteen square miles, bounded on the east by the shores of Indian Bay and Lingan Basin, on the west by Sydney Harbour, on the north by the sea-coast from the North Head of Indian Bay to Low Point Lighthouse, and on the south by a straight line drawn from Mc.-Phee's Ferry, on Sydney Harbour, to tide water in the north-west brook of Lingan: and in a block of two square miles, on the south-east side of Indian Bay, the site of the Bridgeport mines and in Nova Scotia proper to four squre miles of coal-lands at the Albion mines, in the county of Pictou, and to four square miles at the Joggins mines, and four square miles at Spring Hill, in the county of Cumberland.

In the session of 1858 the agreement concluded by the delegates and the Association, as above specified, was submitted to the Legislature of Nova Scotia, and, after much discussion, was duly ratified, notwithstanding the strenous opposition of some leading members of the Liberal party.

Thus, after years of controversy, this vexed question was settled upon a basis which, it is hoped, will ultimately prove beneficial both to the province and the General Mining Association. On the one hand the province was freed from the monopoly of coal, which the Association had enjoyed for thirty years; secured in the control and possession of all the other mines and minerals—now open to the enterprise of its people—and relieved from the constant discussion of an irritating subject, which had long disturbed the harmony of the Assembly, affected the peace and welfare of the country, and threatened to 'lead to a painful and injurious embroilment with the British Government.' On the other hand the Mining Association, now in undisputed possession of the large areas of coal-lands, secured to them by this agreement, was relieved from a moiety of the royalty hitherto paid, which would enable them to reduce their selling prices and extend their operations, perfectly confident in the security of their investments.

It was supposed, and not without reason, that, under this arrangement, an active competition would arise, prejudicial to the interests of the Mining Association, as the result has verified. But it must be borne in mind that the subject had assumed such a serious aspect in Nova Scotia that its settlement, in some form or other, could be no longer deferred without creating complications detrimental to the continuance of the relations which had so long subsisted between the mother country and that loyal province. The Association, therefore, found themselves in this dilemma: they must either have consented to surrender their claims upon the conditions above specified (which the writer, who was one of the committee appointed to confer with the Nova Scotia delegates, can vouch were the best that could be obtained), or have provided means for opening, in a 'bona fide' manner, every mine of every description in the province which any person might apply for, as it was stipulated by an Act of the Legislature of 1853, passed after the British Government had conveyed to the province (under the Civil List Bill) all its interest in the mines—That, upon the application of any person for a lease of an unopened mine, the Government should give notice thereof to the General Mining Association, and, if the Association failed to open and work it within twelve months from the date of the notice, the said mine should be forfeited, and the Government should be at liberty to lease it to the applicant. It is quite preposterous to suppose that, if there had been many applications for leases under this Act, the Association, with so many mines already in operation, could have found capital to open new ones, and that leases, therefore, must have been granted to the applicants, and an active competition must have arisen, whilst, at the same time, the Association would have possessed none of the advantages secured by their agreement with the delegates of Nova Scotia.

Several new collieries have been opened since the question was settled in 1857, which have become active competitors with the Association; but it does not appear the Association has lost much by giving up all the other minerals, as none have been worked except the gold mines, which, though they have given employment to a considerable number of miners and labourers, do not seem to have yielded much profit to those who have embarked their capital in them, as it appears from the Mining Inspector's returns that the cost of working has, in most cases, swallowed up the proceeds of the sales of gold.

CHAPTER X.

The Government of Nova Scotia having, as explained in the last chapter, obtained possession and control of all the mines and minerals of the province except those within the limits specified, in order to give every facility and encouragement to persons disposed to embark in mining adventures, prepared an Act embodying the following favourable conditions, which was passed by the Legislature in the month of Februrary 1858 :—

1. Any person applying to the Chief Commissioner of Mines shall be entitled to a license of exploration, covering a single tract of five square miles upon any lands not already under license or lease for mining purposes, and to dig and explore for minerals other than gold, upon paying the sum of twenty dollars (four pounds sterling) and giving bonds to pay for damages done to private lands. Such license to be in force for the term of one year from the date of application.

2 Upon such application and payment being made, the Chief Commissior of Mines shall cause the lands applied for to be surveyed, and laid off, and a full description thereof embodied in the license of exploration.

3. The cost of the survey shall be defrayed by the Chief Commissioner of Mines, but the search for minerals under such licenses shall be made free of all expense to the Government, and the holder shall, within the time the same shall be in force, make a report of the result of his explorations to the Chief Commissioner of Mines

4. Such licenses of exploration may be renewed for a further period of twelve months, on giving sufficient reasons therefor to the Chief Commissioner of Mines. and on payment of the further sum of twenty dollars.

5. The holder of an exploration license may, at any time before the expiration thereof, select from the

land covered by such license an area of one square mile, for the purpose of working the mines and minerals thereon, and may make an application for a license to work the same on payment of the sum of fifty dollars (ten pounds sterling).

6. Having complied with certain regulations respecting damages to private lands, &c., the applicant shall be entitled to a license to occupy and work one square mile, which shall be in force for two years from the date of application, provided effective mining operations are commenced and continued in good faith until the termination of such term

7. All these conditions having been complied with, the holder of a license to work shall, at the end of the two years aforesaid, be entitled to a lease of the premises described therein, containing all the ordinary provisions of mining leases.

8. Under special circumstances the Governor in Council may authorise the granting a lease, or license, to occupy and work a larger area than one square mile if, upon due investigation, the public interests would be better subserved thereby.

9. All leases of coal-mines shall terminate on, or before, the 25th day of August, 1886 ; leases of mines, other than coal shall be for twenty-one years ; in the granting of leases, there shall be reserved a space of twenty yards in width between the lines of the respective grantees.

10. The produce of all mines, after it has been brought into marketable condition, shall be subject to the following royalties, that is to say :—of five per cent. on all such ores and minerals, except gold, iron, and coal ; of eight cents (3, 8-10d. stg.) on every ton of iron, and of ten cents (4, 8-10d. stg.) on every ton of 2,240 lbs. of coal, payable at such times as the leases shall respectively stipulate.*

11. If any mines or minerals claimed under a lease from the Crown, or under a lease granted pursuant to this Act, have been abandoned for the space of one year, have not been effectively and continuously worked, or have been worked only colourably, or to prevent a forfeiture under the terms of the lease, notice shall be served upon the lessee, requiring him to attend

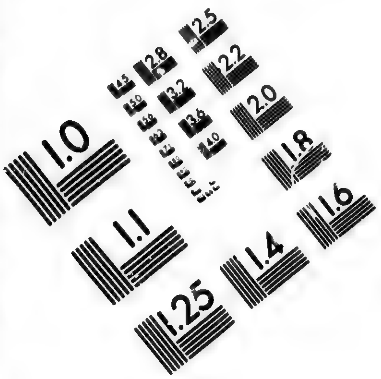
See Appendix.*

at an appointed time and place, for the investigation thereof. The decision thereon shall be left to the Chief Commissioner of Mines, subject to the right of appeal to a Judge in Chambers.

By a subsequent Act, passed in the month of May, 1866, the lessees of all mines in full work on the termination of their leases in 1886, are entitled to the right of renewal thereof for a further term of twenty years, and also to two successive renewals of twenty years each, on the expiration ot those preceding.

The General Mining Association, according to this Act, are entitled to the same privilege of renewing their leases within the limits of such areas as they may be 'actually working' at the time, but not to the large tracts now in their possession.

In consequence of the liberal terms offered to persons disposed to embark in coal-mining, by the provisions of the Act of February, 1858, applications were made by certain parties, early in the spring of that year, tor leases of mining areas at Little Glace Bay, Bridgeport, and Cow Bay, who immediately commenced operations upon a small scale. Coal being, at that time, admitted into the United States free of duty, under the Reciprocity Treaty, the occupiers of those areas were able to dispose of their coal at remunerative prices, which induced many others to follow their example. In the course of the following five years, more than forty licenses of exploration were issued for tracts in the Sydney coal-field alone, and some in the Richmond coal-field, near the Gut of Canceau. During the next three or four years, several licenses were granted for explorations on the west shore of the island between Port Hood and Margaree, and also under the sea along the coast from Mira Bay to Point Aconi. One enthusiastic adventurer even took out a license for a submarine area, accessible only by sinking a shaft upon the little rock called Flint Island, more than a mile from the mainland. Many of these licenses were taken out by persons quite destitute of the means of working them, in the expectation of being able to sell their claims to other parties at a profit. Some of these were fortunate enough to realise their expections, by selling their rights to companies prepared to open the mines; but many others, including those who had taken out licenses for



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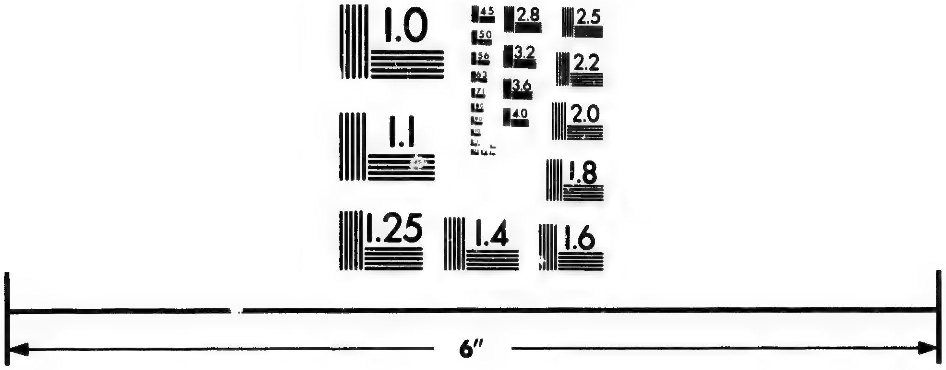

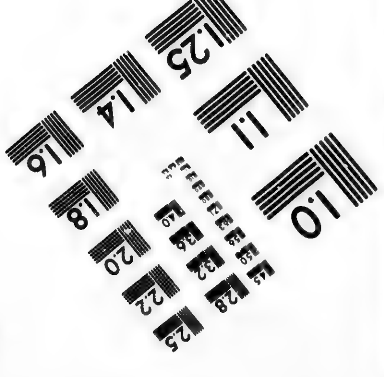

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tracts far beyond the boundaries of the Sydney coal-field, were unable to find purchasers, and consequently were obliged to surrender their licenses.

During the last ten years, many persons who had obtained leases with the 'bona fide' intention of working, and had expended considerable sums in opening mines, being disappointed with the results of their operations, have been obliged to abandon them. Those who were fortunate, however, in securing more valuable locations, have carried out their original plans with more or less success; and, though it is believed their operations have not yielded much profit,* owing to the loss of their best market in the United States, consequent upon the abrogation of the Reciprocity Treaty in 1866, have persisted in keeping their mines open, in the hopes of seeing, at no distant day, their produce admitted into the United States free of duty.

The following list comprises all the new mines that have been opened in Cape Breton since the passing of the Act of 1858—both those now in operation, and those which have been abandoned, In the short account of each mine which follows, it has not been thought necessary to give a detailed statement, in all cases, of the transfers which have been made from the original holders of the leases to the present occupants, as it would merely take up more space, without serving any useful purpose. For the sake of convenient reference, the Roman numerals affixed to the heading of each mine correspond with those marked on the areas occupied by the lessees on the map of the coal-field.

Name of Mine or Colliery	Situation	County
South Head	Cow Bay	Cape Breton
Tracey's	Mira Bay	"
Gowrie	Cow Bay	"
Block House	"	"
Acadia	Schooner Pond	Cape Breton.
Clyde	Glace Bay	"

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* Mr. Moren, the President of the Glace Bay Mining Company, wrote as follows in a Halifax paper on March 14, 1870: 'I claim that our coal owners are entitled to protection, because for several years past they have been literally working for nothing. This is too notorious to require any special proofs from me. I may state this fact, however, known to all the stockholders of the Glace Bay Mining Company, that for the last four years they have received an average dividend of but one and a half per cent. Also, that other coal companies, which have done a larger business, have not paid anything.'

Caledonia	"	"
Glace Bay	Little Glace Bay	"
International	Bridgeport	"
Victoria	Low Point	"
Ingraham's	Bras d'Or Road	"
Collins	Little Bras d'Or	"
Matheson's	"	"
Black Rock	Great Bras d'Or	"
New Campbelltown	"	Victoria
Chimney Corner	Margarie	Inverness
Broad Cove	Gulf Shore	"
Mabou	"	"
Port Hood	St. George's Bay	"
Richmond	Little River	Richmond.
Sea Coal Bay	Gut of Canceau	"

See Appendix.

I. THE SOUTH HEAD COLLIERY, COW BAY.

The mining area upon which this colliery is situated consists of about fifty acres, situated at the extreme end of the narrow promontory lying between Mira and Cow Bays. It will be seen by reference to the section (p. 21), that there are several seams of coal in this area, but hitherto the workings have been confined to the second group in the series, consisting of four beds of coal, separated by thick strata of shale and fire-clay. In this group there are eleven feet and a half of coal, but the lowest bed, only three feet and a-half in thickness, is supposed to be worth working. This part of the seam is said to be of good quality, hard and compact, and capable of withstanding exposure to the weather. It contains about 262,500 tons of coal.* The mine was first opened in 1863, by means of a level driven from the eastern shore of the bay, where a wharf was erected, which was destroyed by a gale in 1867. When the present owners of the mine—a New York Company—purchased the lease, they sunk a pit seventy-one feet in depth, about eighty yards from the crop of the seam, and erected an engine of ten horse-power to raise the coal. A light railway, three-quarters of a mile in length, was also laid down to a new wharf further up the bay. This second wharf also was almost totally destroyed by an early gale in 1869. It has not since been rebuilt. The sales since the mine was first opened in 1865 have averaged about 1,200 tons per annum. See Table V.

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* In this and the subsequent estimates of the quantity of coal in each area it is assumed that each acre of coal one foot in thickness contains 1,500 tons, taking the average specific gravity at 1·250.

II. TRACEY'S COLLIERY, MIRA BAY.

This Colliery was opened on the seam, marked No 9 in the sectional diagram at p. 19, near its outcrop at the north end of False Bay Beach, by Mr. Tracey and some others in 1864. The extent of their mining area, is about one square mile, and contains 3,520,000 tons of coal. This seam, supposed to be the lowest in the coal-field consists of an upper bed two feet six inches, and a lower one foot two inches in thickness, separated by a ten-inch layer of shale. In 1864, 540, and in 1865, 2,391 tons of coal were raised, but as the quality did not prove so good as had been anticipated, the mine was abandoned in the following year.

III. GOWRIE MINES, COW BAY.

This mining area, consisting of 1,280 acres on the north side of Cow Bay, was leased to Messrs Archibald & Co., of North Sydney, in 1861. There are two workable seams of coal upon this property, the McAulay of four feet ten inches, and the McRury of four feet four inches in thickness (see diagram, p. 19, and section, p. 20), dipping to the north-east at angle of six degrees The contents of this area will be—

		Ft.	in.		
In the McAulay seam,	775 acres	4	10	thick	5,500,000
" McRury "	965 "	4	4	"	6,372,000
				Tons	11,872,000

The greatest depth of the McRury seam from the surface will be about 200 yards in the centre of the basin.

Operations were commenced in the first instance by opening an old French working in the McAulay seam near the shore, from whence a level was driven on the strike. In 1864, a pit seventy-five feet in depth was sunk thirty-five chains from the shore, upon the continuation of the level, but this having proved incapable of supplying all the coal required, a new pit was sunk 350 yards to the dip of the level. The pit is 208 feet in depth, and is worked by a twenty-five horse-power engine, capable of pumping the water and raising 300 tons of coal per day.

Owing to the presence of a peculiar slickensides fracture crossing the usual cleats or joints, this coal can be worked without blasting, which prevents much breakage, but, on the other hand, for the same reason, it can only be obtained in small lumps. The proportion of small coal made in working is very large, amounting to one-third of the whole of the produce. The Gowrie coal by analysis consists of—

Moisture	1
Volatile matter	27·08
Fixed carbon	60·45
Sulphur	3·42
Ash	7·25
	100·00

It yields, according to the report of the New York Gas Company, which took a considerable quantity of this coal in 1865, 9,000 cubic feet of gas per ton. It has not since been shipped for that purpose, on account most likely of the presence of an excess of sulphur. Notwithstanding the large proportion of ash, it is much esteemed for raising steam, as it does not form a clinker on the furnace bars. It is also used to some extent in the Colonies, chiefly for domestic purposes.

The shipments, since the colliery was opened nine years ago, have averaged 27,000 tons of large and 7,000 of small per annum, of which about equal proportions have been sold in the Home market, the British Colonies, and the United States, exclusive of an average sale of about 2,000 tons during the last five years in the West Indies.

The coal is conveyed by a railway, three-quarters of a mile in length, from the pit to a wharf constructed at a great expense on the north shore of the bay, where vessels drawing seventeen feet can load at low water. This wharf is 1,300 feet in length, and though protected by a breakwater 300 yards to the eastward, erected at a cost of 18,000*l*., it is not a safe place for vessels to load at all times, being exposed to the heavy swell that sets into the bay during south-easterly gales. Several fine vessels have been lost in Cow Bay since it was first used as a shipping place. There is little risk during the summer season; but late in the autumn, when easterly gales spring up so suddenly that vessels have not time to get out of the bay, it is not a safe shipping place. This is proved by the fact that shipowners at that season demand a higher rate of freight to cover the risk. In the face of this difficulty, nevertheless, the experience of the last few years has proved that a considerable export of coal can be made from Cow Bay.

IV. THE BLOCK HOUSE MINE, COW BAY.*

The tract, on the north side of Cow Bay, covering an area of 1,280 acres, was first leased to Mr. Marshall Bourinot, of Sydney, in 1859, by whom it was sold, in 1863, to a New York Company. There are three workable seams (above three feet in thickness) upon this property, namely, the uttermost or Block House seam, nine feet; the middle, or McAulay, four feet ten inches, and the lowest, or McRury, four feet four inches in thickness. The Tracey seam, already described, underlies both the Block House and the Gowrie areas, but at such a great depth as to render it practically inaccessible. The Block House seam, lying in the centre of the Cow Bay basin, occupies an area of about 200, the McAulay 550, and the McRury 580 acres. As at least one-fourth of the area of the Block House seam has already been worked out, there remains only about 150 acres of solid coal. No coal whatever has been taken from the two other seams in this area; therefore, it contains at present the following quantity of coal:—

		Ft.	in.		
In the Block House seam,	150 acres	9	0	thick	2,000,000
" McAulay "	550 "	4	10	"	3,980,000
" McRury "	580 "	4	4	"	3,770,000
				Tons	9,750,000

The block House mine was first opened by driving a level through some old workings into the solid coal, where a pit was sunk near to the shore. Most of the coal is now drawn up an inclined plane or slope from the workings to the level of the wharf, by an engine of forty-five horse-power, from whence it is discharged into the vessels. In the winter months, when no vessels are loading, it is raised up a shaft to the surface by an engine of forty horse-power, where it is deposited ready for shipment in the following summer. This pit communicates with the wharf by means of a light railway one quarter of a mile in length. The wharf is about 800 feet in length, having a depth of twenty feet at its extreme end at low water. A large business can be done in fine weather, but during easterly gales the bay is open to the swell of the Atlantic, when vessels can neither lie at the wharf nor at anchor in safety. The wharf, too, having no protection by means of a breakwater, as in the case last mentioned, is liable in the spring to be seriously damaged by the large masses of drift ice which float into the bay. It has been more than once nearly totally destroyed either by easterly gales or drift ice, and several vessels, loading or waiting their turns to load, have been wrecked. The want of a good secure place of shipment is much felt by the owners of the mines at Cow Bay and in the vicinity. It is well worth their while to consider whether they would not be gainers by jointly constructing a railway either to Louisbourg or Sydney, or by connecting their works by means of short branches with the line recently made by the International Company from Bridgeport to the latter harbour.

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* Correct accounts of the quantity of coal shipped from the Gowrie, as well as all the other new mines, since they were first opened up to the end of the year 1870, will be found on Table V.

The quality of the Block House coal is very superior, being free from sulphur and other impurities. The seam is also free from faults, but the workings are often interrupted by large wedge-shaped masses of shale which penetrate in its various directions, thereby causing much trouble to the miner and expense to his employers. It consists, by analysis, of—

Moisture	5·00
Volatile	33·80
Fixed carbon	55·80
Ash	5·40
	100·00

It is chiefly used in the manufacture of gas in New York and Boston, and is reported to yield 10,500 cubic feet per ton. It is also said to have given satisfactory results when mixed with Welsh steam coal, having effected a saving of twelve per cent. in consumption, compared with Welsh coal alone. During the eleven years the colliery has been in operation the shipments have averaged 47,000 tons per annum.

V. ACADIA COLLIERY, SCHOONER POND.

This mining area, comprising 640 acres, was taken up by Mr. Ross in 1862. There is only one workable seam on the property, five feet in thickness, dipping nearly due north at an angle of six degrees. Its relalative position in the Glace Bay series will be seen by reference to the diagram and section at page 17. As the seam crops out close to the northern boundary of the area and dips under the lands of the Clyde Company, the quantity of coal that can be obtained is very trifling—quite insufficient for the establishment of a colliery except upon a very limited scale. The mine was opened in 1863 by means of a level driven from the sea shore. The coal is said to be of good quality, suitable for raising steam, and for the manufacture of gas yielding 9,500 cubic feet per ton. Owing to the exposed situation of the place of shipment in the open bay, which can only be used in fine weather with an off-shore wind, very little work has been done at this colliery. In the three years ending in 1866 the shipments averaged 2,800 tons per annum. No coal has been raised since that year, except a few tons in 1869. It is said the owners of the Acadia Colliery have sold their area to the Clyde Company which occupies the adjacent area.

VI. CLYDE COLLIERY, GLACE BAY.

The tract owned by the Clyde Company comprises an area of 880 acres on the coast between Glace Bay and Schooner Pond. There are three seams of coal upon the property,—the Phelan, averaging seven feet nine inches ; the Ross, five feet ; and the Back Pit, one foot six inches,* in thickness. (See diagram and section, p. 17). The Phelan seam occupies an area of 490, and the Ross of 785 acres. The quantity of workable coal is, therefore—

			Ft.	in.		
In the Phelan seam,	490	acres	7	9	thick	5,800,000
" Ross "	785	"	5	0	"	6 700,000
				Tons		12,500,000

Operations were begun in 1863 by driving a slope from the crop of the Phelan seam, dipping north at an angle of seven degrees. It consists of—

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* In the Glace Bay section this seam is four feet six inches in thickness. In its course to the eastward it has decreased to one foot six inches.

Volatile matter	33·00
Fixed carbon	57·37
Ash	9·63
	100.00

Owing to an excess of ash, it is not a first-rate coal for raising steam, but it is well adapted for domestic purposes, and also for gas-making, yielding 9,700 cubic feet per ton. In the three years ending in 1866, the shipments averaged 6,000 tons per annum. Very little has been done since, on account of the difficulty and expense of maintaining the wharf in good order. It has been found quite impossible to build a wharf capable of withstanding the pressure of the immense fields of ice driven upon the coast by easterly gales every spring. A costly structure of wood, 400 feet in length, has more than once been destroyed by drift ice.

VII. CALEDONIA COLLIERY, GLACE BAY

The mining area owned by the Caledonia Company comprises about 1,340 acres, situated to the south-east of Little Glace Bay Brook. About half of this area lies under the land—the remainder under the adjacent waters of Glace Bay and Glace Bay Pond. There are five seams of coal upon the property, but as two of them, the 'Three Foot' and the McRury seams, are under four feet in thickness, they will not be taken into account. There are also the Lorway and Gardener seams, of four feet six inches and four feet nine inches, but they lie at such a depth from the surface, namely, 500 to 600 feet at their highest point within the area, that they will be left out of the following estimate of the quantity of coal available at a moderate depth, All these seams will, no doubt, be worked at a future day; but it is not probable that they will be opened until the coal, now so abundant in more accessible situations, has been nearly exhausted. For the present, then, we have three workable seams on this area—the Back Pit, four feet and a-half in thickness, underlying an area of 658 acres; the Phelan, of eight feet, under 970; and the Ross, of five feet, under 1,270 acres. (See diagram and section, p. 17.) The area therefore contain —

			Ft.	in.		
In the Back Pit seam,	658	acres	4	6	thick	4,440,000
" Phelan "	970	"	8	0	"	11,640,000

"	Ross	" 1,270	"	5	0 "	9,525,000
					Tons	25,605,000

The average depth of the seams from the surface does not reach 100 yards; at the lowest point, near Hilliard's Cove, the Ross seam will be found at a depth considerably under 200 yards. Operations were commenced in 1865 by sinking pumping, and drawing shafts 168 feet in depth upon the Phelan seam, which dips to the north-east at an angle of five degrees. This seam averages eight feet in thickness, but only six feet and a-half are worked, the remainder being left to support the tender shale roof.

The coal of this seam, by analysis, consists of—

Volatile matter	33·00
Fixed carbon	57·37
Ash	9·63
	100·00

According to the report of the Cambridge Gas Company, it yields 9,700 cubic feet of gas. The coal is conveyed by a railway, two miles in length, to Port Caledonia, on the eastern side of Glace Bay Pond, where a capacious dock has been excavated in the sand beach communicating with the sea by means of a channel eighty feet in width, protected by two parallel piers constructed of strong piling filled in with stone, about 1,200 feet in length. The depth of water is fifteen feet and a-half, but, it is liable to be filled with sand, as there is not at present any outflow of water to scour it out. The railway, harbour, and general equipment of the colliery were completed in 1868. The shipments during the last three years have averaged 19,000 tons of large and 1,000 tons of small coal per annum, the greatest part of which has been sent to the United States for gas manufacture.

VIII. GLACE BAY COLLIERY, LITTLE GLACE BAY.

The mining rights owned by the Glace Bay Company extend over an area of 1,400 acres. There are five workable seams on the property, each more than four feet in thickness, within a moderate depth from the surface; and two seams—The Lorway and Gardener—of the thickest already mentioned, but too deep to be worked with advantage. The two latter will not, therefore, be included in the following estimate of the quantity of coal in the area. Taking the seams in descending order, the contents are—

			Ft.	in.		
In the Hub seam,	140	acres	9	8	thick	2,000,000
" Harbour "	920	"	5	0	"	6,900,000
" Back Pit "	1,160	"	5	6	"	7,800,000
Phelan "	1,350	"	8	3	"	16,700,000
Ross "	1,400	"	5	0	"	10,500,000
						43,900,000

The relative position of these seams will be seen by reference to the diagram and section of the Glace Bay series at p. 17. Their dip is north-east at an angle of five degrees. According to the report of the Philadelphia Gas Company, the Hub seam coal yields 10,000 cubic feet of gas per ton, but at the Halifax Gas Works only 8,500 feet were obtained. By analysis it yields—

Moisture	5·52
Volatile matter	31·02
Fixed carbon	62·53
Ash	93
	100·00

The Glace Bay coals are chiefly used in the manufacture of gas in the United States, but they are said to be well adapted for raising steam, lighting quickly and burning freely.

The lease of the Glace Bay area was first taken up by Mr. Archbold, of Sydney, in the Spring of 1858, who opened both the Hub and Harbour seams by driving levels from the shore. The coal was taken off in boats to vessels anchored in the open bay. When Mr Archibold transferred the lease, in 1861, to the present holders—the Glace Bay Company, composed of shareholders residing chiefly in Halifax and Boston—a powerful steam dredging engine was built for excavating a dock or harbour in the long narrow pond at the head of Little Glace Bay. The Hub seam was also opened by sinking a pair of shafts 130 feet in depth, and the Harbour seam by a shaft forty feet in depth close to the harbour. Two steam engines of fifteen and thirty horse-power are employed in working the mines. A railway, one mile and a-half in length, connects the

Hub Pits with the wharves. The artificial harbour, formed by dredging, now covers an area of six acres, which is to be further enlarged. It communicates with the bay by a channel or entrance sixty feet in width, having a depth of seventeen feet, and is protected by parallel piers 450 feet in length made of strong piling. The amount expended in forming this harbour up to the year 1866 is said to have amounted to 22,000*l*. A steam tug is employed for towing vessels into the harbour. The average sales to the end of 1870 have amounted to 33,000 tons of large and 2,000 tons of small coal per annum, most of which is shipped to New York and Boston. In 1864, before abrogation of the Reciprocity Treaty, Glace Bay coal was sold at $2,40, or 9s 7d. sterling, per ton, which, it is said, enabled the directors to pay a dividend of 40 per cent. to the shareholders.

IX. INTERNATIONAL MINES, BRIDGEPORT.

This area of four square miles was taken up in separate lots, in 1858, by Messrs. Cadougan and McLeod, by whom it was sold in 1863 to the International a New York company. There are four workable seams of coal on the property, exclusive of the Lorway and Gardener seams, which are found at an inconvenient depth for working, namely, the Harbour, Back Pit, Phelan, and Ross seams. (See diagram and section, p. 17.) The average dip being north-east, at an angle of four degrees, the depth of the Ross, the lowest seam at the extremity of the area, will be 320 yards below the surface. Taking the several seams at the thickness given in the section (p. 17), the total quantity of coal will amount, as shown in the following statement, to 47,600,000 tons

	Ft.	in.		
In 540 acres of the Harbour seam	5	0	thick	4,000,000
" 1,470 " " Back Pit "	4	6	"	9,900,000
" 1,650 " " Phelan "	8	3	"	20,500,000
" 1,760 " " Ross "	5	0	"	13,200,000
			Total Tons	47,600,000

All the coal hitherto raised on this area has been taken from the Harbour seam. No analysis has been published, but it is said to be a hard, compact coal, standing the weather better than many of the Cape Breton coals, and to be, comparatively, free from shale and sulphur. It is used in the United States chiefly for gas-making. The mine was first opened in 1858, by driving a level from the shore along the strike of the seam, from which bords were worked at right angles up to the outcrop. The coal was taken off in scows to vessels at anchor in the open bay. When the International Company purchased the property in 1863, they surveyed and marked out a line of railway from the mines to the harbour of Sydney, a distance of twelve miles and a half, with the intention of immediately proceeding with its construction; but, owing to the abrogation of the Reciprocity Treaty, and the imposition of a duty of five shillings per ton, the intention was suspended. In the year 1869, having good reason to expect that the duty would soon be taken off, the directors of the company decided upon the construction of the railway, which was completed and opened for use in the autumn of 1870. The situation of the shipping wharves is near the town of Sydney. The wharf is one thousand feet in length,and is provided with berths suitable for vessels of the largest class. The railway, with its equipment of locomotives and waggons, will afford great facilities to those mining companies which do not possess any places of shipment, as it is understood the International will soon be prepared to carry and ship their coal at moderate rates. The only pit now in operation is about 80 feet deep, sunk upon the original level, at a distance of ,200 yards from the shore. It is worked by a small engine of ten horse-power. Having now completed their railway, the International will, no doubt, soon prepare pit-room upon a larger scale, commensurate with the demand for their coal which, it is said, can readily be sold in the United States. Owing to the want of a safe place of shipment, the sales, from the opening of the mine in 1858 up to the close of 1870, have not averaged more than 6,000 tons of large, and 1,500 tons of small coal per annum

X. VICTORIA MINES, LOW POINT.

The area owned by the Victoria company lies under the waters of Sydney Harbour, and is bounded at high water mark by the Lingan tract of the General Mining Association. It extends, according to the best information the writer has been able to obtain, about four miles along the shore from McPhee's Ferry to Low Point lighthouse, having an average width of half a mile, and consequently comprises an area of 1,280 acres. It will be seen, by reference to the section at p. 23, that six seams of coal, of a thickness of four feet or upwards, crop out on the Low Point shore within the limits of this area, which, if undisturbed by faults, probably extend, from their respective outcrops down to its northern boundary. Assuming this to be the case, which is very doubtful, the quantity of coal contained in the area will exceed 50,000,000 tons, as shown in the following statement :—

				Ft.	in.		
In	Carr's seam,	782	acres	4	0	thick	4,690,000
"	Paint's "	980	"	9	0	"	13,230,000
"	Crandall"	1,052	"		4		6,700,000
'	Ross "	1,150	"	6	7	"	11,350,000
'	McGilvray	1,295	"	5	0	"	9,710,000
'	Frazer "	1,595	"	4	2	"	9,960,000
				Total tons			55 640,000

In estimating the area of each seam, it must be observed that its width from the crop to the northern boundary has been taken upon the slope, not upon the horizontal width of the surface. In consequence of the rapid dip of the seams, the quantity of coal contained in each superficial acre is about one fourth more than in seams of an ordinary inclination. This advantage, however, is more than counterbalanced by the growing expense of pumping water and drawing coal, which increases proportionably with the depth. It is questionable how far these seams can be worked to the dip at a cost which will remunerate the owners, and considering that the Ross seam at its lowest point in the area is 4,800 feet below the surface, it is evident that, at anything like the present selling price of coal, only a small portion of the total quantity above estimated can be economically worked. Besides, great caution will be necessary in working, as all the seams crop out under the waters of the harbour. In working the main seam at the Sydney mines, some years ago, the sea water found its way into the exploring levels through a thickness of 300 feet of strata, which it was necessary to shut off by strong framed dams.

When the Victoria mine was first opened in 1865, bords were commenced at the foot of a slope 300 feet from the outcrop, but it was abandoned in consequence of the quantity of salt water which found its way into the works. The mine is now worked by a new slope 650 feet in length, two steam engines being employed in drawing coal and pumping water. The 'Ross' is the only seam at present worked; its total thickness (see section, p. 23) is 6 ft. 7 in., but 4 in. at the top, of inferior quality, is left. The Ross coal, according to Dr Dawson's analysis consists of—

Volatile matter	38·70
Fixed carbon	58·40
Ash	2·90
	100 00

The coal is conveyed by a railway three miles and a half in length, to a wharf at the South Bar, in a safe and well-sheltered situation with sufficient depth of water for vessels of large burthen. The shipments during the last three years have averaged 2,500 tons of large and 500 tons of small coal per annum, most of which has been sold in the British Provinces.

XI. INGRAHAM'S COLLIERY, BRAS D'OR ROAD.

The lease of the area upon which this colliery is situated was taken up by Messrs. Roach and McInnis in 1863, by whom it was sold to the Messrs. Ingraham, the present owners. It adjoins the General Mining Association's Sydney Mines Tract, and covers an area of one square mile. There is only one seam of coal on the property, 4 ft. 8 in. in thickness, of inferior quality, dipping to the north-east at an angle of six degrees. The quantity of coal in the area is very trifling, occupying only about 20 acres on the crop of the Indian Cove seam. (See section, p 11.) It was opened in 1864 by driving a slope from the outcrop to the dip. A few tons of coal were raised at intervals during the next four years for land sales, but it was abandoned in 1869, and is now filled with water.

XII. COLLINS' COLLIERY, LITTLE BRAS D'OR

In the year 1859, Mr. Gotreau took out a lease of a small area on the south side of the Little Entrance of the Bras d'Or lakes, adjoining the General Mining Association's Sydney Mines Tract, which he sold in 1863 to Mr. Collins, who in that year obtained a lease of an adjoining area. This property now occupied by Mr. Collins, contains 640 acres. It includes the workings of the mine opened by the General Mining Association in 1833. There is only one seam of coal upon the doubt identical with the Indian Cove seam of the Sydney Mines section. The area of the seam within the limits of the lease is about 450 acres, and will consequently contain about 2,700,000 tons of coal. A colliery upon a very small scale was opened by Mr. Ross in 1867 by driving a level from the shore. Owing to the inferior quality of the coal the sales have not exceeded 200 tons per annum. As there is not a safe place for shipment within a reasonable distance it is not likely that this colliery will be long worked, as it can not compete with so many others much more favour ably situated in every respect.

XV. NEW CAMPBELLTON COLLIERY, GREAT BRAS D'OR.

The mining area upon which this colliery is situated, on the north side of the Great Entrance of the Bras d'Or, and at the western extremity of the Sydney coal-field, comprises 640 acres.

There are two workable seams of coal upon the area—one four, and the other six, feet in thickness. The peculiar position of these seams will be learned by reference to the description given of the Cape Dauphin district at page 16. It is impossible to state the extent of each seam, as they have not been observed at more than two or three places, and the stratification is so much distributed by the protrusion of the syenitic ridge of St. Ann's, that their continuation in any given direction cannot be determined.

If the two seams underlie the whole of the area, which is extremely doubtful, it will contain over 9,000,000 tons of coal. A lease of this area was granted to Mr. Campbell in 1862, who commenced operatious by driving a level from the valley at the foot of the hill, which intersected the six feet vertical seam at a distance of 151 yards from the entrance, and at a depth of 90 feet from the outcrop, Both the four and six feet seams were worked at the same time by means of this level or tunnel. Subsequently, the four feet seam was opened in the valley mentioned at page 16. where it dips to the east at an angle of twelve degrees, by means of a slope area, 5 ft. in thickness, supposed to be the stony seam of the Sydney Mines section (pp. 11, 13), which dips easterly at an angle of six degrees. Its limits have not been accurately ascertained, but as its area probably does not exceed 100 acres, it will not contain more than 750,000 tons of coal. The mine has been partly worked by a level from the shore, and partly by a slope driven from the outcrop at a point 250 yards inland. The shipping-place is conveniently situated close to the works, where vessels of large burthen can load. Vessels of small draught can reach the sea through the Little Entrance, but those drawing more than 6 ft. of water must go all round the island of Boulardrie to the Great Entrance, a distance of 45 miles. The coal, though sold at a low price has failed to find a market for the reasons stated at p. 68. From 1861 to 1865 the sales of coal averaged 4,000 tons of large and 270 tons of small per annum. No coal whatever was raised in 1866, and only a few hundred tons in 1867 and 1868. During the last two years the mine may be said to have been practically abandoned, the sales having reached only 40 tons.

XIII. MATHESON'S COLLIERY, LITTLE BRAS D'OR.

The area upon which this colliery is situated was taken up by Mr. Campbell in 1862, who subsequently sold or leased it to Mr. Matheson. It contains 640 acres. There is only one seam of coal upon the property, three feet in thickness, dipping to the east at an angle of eight degrees. As this seam crops out close to the General Mining Association's coal lands, and dips immediately under them, its extent does not exceed five or six acres. Its identity has not been clearly established, but it probably is a continuation of the seam worked by Mr. Collins on the opposite side of the Little Entrance of the Bras d'Or. The shipments up to the close of 1868, when the mine was abandoned, averaged only 800 tons per annum.

XIV. BLACK ROCK COLLIERY, GREAT BRAS D'OR.

The Black Rock area of 640 acres, was leased to Mr. Campbell in 1864. There is only one workable seam of coal upon this area, 4 ft. in thickness, dipping north-east at an angle of six degrees. This seam, for the reasons fully given at pp. 11, 13, is beyond all driven from the outcrop. Owing to the difficulty of keeping this slope free from water it was abandoned in 1866, since which time the workings have been confined to the vertical seams. The average sales from 1863 to 1869, inclusive, were 4,000 tons of large and 350 tons of small per annum. The sales reached their highest figure in 1866, since which they have been declining, having fallen in 1870 to 309 tons of large and 154 of small coal per annum. This colliery possesses an excellent place of shipment at Kelly's Cove, suitable for vessels of the largest burthen, two miles distant by the railway from the vertical seams ; but this important advantage is not sufficient to compensate for the inferior quality of the coal, which, though sold at a low price, cannot obtain a market in competition with the produce of most of the other Cape Breton mines. See Appex.

XVI. CHIMNEY CORNER COLLIERY, MARGARIE.

This colliery was opened in 1867. No mention is made in the government reports of the extent of the area leased, but it probably does not exceed one square mile. The seam in which the workings have been commenced is five feet in thickness, dipping north at an angle of forty degrees, being the middle seam in the section given at p. 28. No data have been furnished from which the quantity of coal in this area can be ascertained. Owing to its rapid dip and the want of a secure place of shipment—the nearest being Port Hood 40 miles distant—it is questionable whether this seam can be worked profitably, although it would seem that the lessees are of a different opinion, as they have expended during the last two years nearly 3,000*l*. in opening the works, erecting a steam engine for pumping and drawing, and building houses for their workmen.

The coal sold during the last four years has averaged only 125 tons per annum.

XVII. BROAD COVE AREA, GULF SHORE.

A lease of this area of one square mile, was granted to Messrs. McCully and Blanchard in 1865, who proposed to open a mine upon the seven feet seam. (See section, p 28.) The coal is of good quality, consisting of, according to analysis—

Moisture	9 00
Volatile matter	34·00
Fixed carbon	57 00
	100 00

This seam dips to the north at an angle of ten degrees, but no estimate can be made of the quantity of coal in the area, as its limits have not been defined. As there is no safe place of shipment nearer than Port Hood, the lessees proposed to form an artificial harbour by cutting a channel through the beach into a sheet of water called McIsaac's Pond, in the vicinity. An attempt was made to organise a company in London in 1866 to open the mine and construct the harbour, but without success. Fifty tons of coal were raised in 1867, but since that time the lessees have wisely taken no active steps for establishing a colliery, as it would be impossible to ship any considerable quantity of coal in such an exposed situation; and it is very doubtful whether a harbour, if constructed, could be kept open upon a coast unprotected from the sand and shingle which accumulates during the prevailing westerly winds on the Gulf shore.

XVIII MABOU AREA, GULF SHORE.

An attempt was made in 1866 to open a mine in one of the valuable seams at this place, but it does not appear from the inspector's reports that any progress has been made in the undertaking up to the close of 1870. This is owing, it is presumed, to the want of a good harbour for shipping the products of the mine within a reasonable distance. Although the area of the coal basin is not great, as will be seen from the description of the coal measures at this locality (p. 27), the quantity of coal contained in one square mile will amount to 27,000,000 tons, the aggregate thickness of the four workable seams being more than twenty-nine feet. It will be long, however, before this coal can be made available for economic uses; for in addition to the want of a harbour, the cost of raising the coal will be comparatively great on account of the rapid dip of the seams.

XIX. PORT HOOD COLLIERY, ST. GEORGE'S BAY.

An attempt to establish a colliery at Port Hood, was made in 1865, by the 'Cape Breton Mining Company,' by driving a slope from the crop of the six feet seam. (See section, p. 27.) An engine of fourteen horse-power was erected, and a considerable outlay incurred in buildings, &c.; but, owing probably to the quality of the coal, the works have been suspended since 1867. There is a safe shipping-place close to the works. In 1866, the company sold 1,657 tons of large and 1,171 of small; and in 1867, 3,710 tons of large and 765 of small coal; but none has been raised since. It is not likely that operations will be resumed, as none of the mines on the west side of the island can possibly compete with the collieries of the Sydney district.

XX. RICHMOND COLLIERY, LITTLE RIVER.

This colliery is situated on the banks of Little River. a small stream running into the basin of the river Inhabitants, near the southern end of the Gut of Canceau. A description of the seams will be found at p. 29. A lease was taken out in 1859 by Mr. Marmaud, who subsequently transferred his interest to an American company. In 1865 a shaft 200 feet in depth was sunk, and a crosscut driven to intersect the two vertical seams—one three, the other four feet in thickness—which are separated by 154 feet of sandstone and shale. The coal, according to Dr. Dawson's analysis, consists of—

Volatile matter	30·25
Fixed carbon	56·40
Ashes	13·25
	100·00

An engine of thirty horse power was erected for pumping and drawing; a railway, three miles in length, constructed to a secure place of shipment in the basin of the river Inhabitants, and every preparation made for an active business; but, for some reason not stated (probably the great cost of working the coal), the works were entirely suspended in 1867. From 1863 to 1867, inclusive, the shipments averaged 700 tons of large coal per annum.

XXI. SEA-COAL BAY, GUT OF CANCEAU.

An attempt was made in 1861 to establish a colliery at this place, but, as might have been expected, without success, the mixed bed of coal and bituminous shale, containing, according to Dr. Dawson's analysis, thirty per cent. of ash, being quite unfit for any industrial purpose. (See p. 30.) A considerable amount has been expended in explorations, and in erecting wharves and buildings. The shipments from 1863 to 1867 averaged 270 tons of large and small coal per annum, but no coal has been raised since the latter year.

NEW MINES IN PROGRESS.

Since the preceding pages were written, a new company has been formed in London, called the 'Glasgow and Cape Breton Coal and Railway Company,' for the purpose of working the seams in a reserved area of one square mile, situated in the rear of the General Mining Association's area on the south side of Indian Bay; and for constructing a railway from thence to Fresh Water Creek near the town of Sydney. Three seams have been opened at the outcrop said to be 8 feet, 6 feet 9 inches, and 4 feet in thickness, which are probably continuations of the Phelan, Ross and McRury seams of the Glace Bay section, although they do not quite agree in thickness with the latter. The Lorway, Gardener, and Tracey seams, will be found upon this property, but at a great depth; they are therefore left out of the following estimate of the quantity of coal contained in the area, as it is not likely they will be worked for many years to come:—

		Ft	in		
In the Phelan seam,	170 acres	8	0	thick	2,040,000
" Ross "	430 "	6	9	"	4,353,000
McRury "	540 "	4	0	"	3,240,000
				Total tons	9,633,000

According to their prospectus, the directors of the Glasgow and Cape Breton Coal and Railway Company expect to sell 100,000 tons of coal, at a profit of 15,000*l*., per annum. They also propose to construct, in addition to their own main line of ten miles from their works to Sydney, branches about twelve miles in length, to the Block House, Gowrie, Acadia, Clyde, and Caledonia collieries; to carry their produce to Sydney at the rate of three halfpence per ton per mile; three of the companies through whose property the railway will pass, having offered to guarantee to send from 50,000 to 100,000 tons each over their line annually.

Estimating that they will derive a profit of 19,167*l*, from this source, after paying all charges in addition to 15,000*l*. per annum from the profit on the sale of coal, the directors conclude that they will be able to pay their shareholders an annual dividend of thirty-four per cent. on their capital of 100,000*l*.

As the chief object of the writer is to state facts for the information of persons interested in the Cape Breton mines, he refrains from making any comments upon the above estimates, sincerely wishing that the flattering anticipations of the directors of the Glasgow and Cape Breton Coal and Railway Company may be realised because, in that case, other companies which, under more favourable conditions, have for years derived little or no profit from their collieries in Cape Breton, may then look forward hopefully to as good, if not better, returns from their outlay.

Two other leases of one square mile each have been recently granted upon the Lorway and Gardener seams of the Glace Bay series, (see p. 18), but nothing has yet been done beyond the sinking of trial pits to prove the seams. When collieries are opened the proprietors will have the advantage of sending their produce to Sydney, either by the International or the Glasgow and Cape Breton Company's railways.

See Appendix.

CHAPTER XI.

Having completed our survey of the new mines opened between the years 1858 and 1870, inclusive, it will now be necessary, in order to furnish the reader with an account of the present condition and capabilities of 'all' the mines in Cape Breton, to notice the improvements made at the works of the General Mining Association during the same period. The collieries of the association, as has been shown in a former chapter, were able to supply all the demand previous to the year 1856, when the Reciprocity Treaty came into operation; but when the heavy duty with which coal had hitherto been burdened was removed, it was reasonably expected that a vastly increased demand would arise in the

United States, and preparations were accordingly made for meeting it. As the area of 'whole' coal at the Sydney mines was rapidly diminishing, it was determined to open a new colliery upon the main seam at Cox Hill, two miles to the westward of the old mines, where its continuation, thickness, and good quality had been proved by trials along its outcrop. A branch railway from the main line was therefore commenced, and a considerable sum expended therein, when it was discovered, by further explorations, the seam thinned so rapidly to the dip, that the intention of opening a colliery at Cox Hill was abandoned.*

In this emergency the directors decided upon opening a new colliery near Lloyd's Cove to work the main seam upon their submarine area of five square miles, of which a lease was obtained from the Government in 1865. For this purpose the sinking of two shafts was commenced in 1865, but, as heavy feeders of water were met with about 300 feet from the surface which overpowered the small engines erected for keeping the shafts clear of water, it was deemed advisible to suspend the sinking until the permanent pumping and coal-raising engines should be erected. These powerful engines have now been erected, and the sinking will be resumed. The pumping engine is a single cylinder high-pressure Cornish engine of 240 horse-power nominal ; the cylinder being 62 inches in diameter, with a nine feet stroke ; the beam, which is 34 feet in length, weighs 18 tons. The winding or coal-drawing engine of 160 horse-power nominal has two high pressure horizontal cylinders, 36 inches in diameter, with a five feet stroke, connected by a crank shaft 15 inches in diameter, carrying a rope drum 20 feet in diameter; which, making full allowances for ordinary delays and stoppages, is capable of raising 1,000 tons of coal per day of ten hours. The depth of the shafts will be about 650 feet. The water will be raised by means of two lifts of pumps 20 inches in diameter. These engines are, beyond all doubt, the most perfect and most powerful that have been erected for mining purposes in British

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* The amount expended on this branch will not be lost, as it will form part of the line from Sydney Harbour—the nearest good shipping-place—to Point Aconi, when the valuable seams in the Boulardrie district are opened at some future day.

America.* When the sinking of the shafts is completed, the Sydney mines will be able to supply 300,000 tons of coal per annum, in addition to the 150,000 tons per annum which the present works are now capable of furnishing. The engine houses, furnaces, and everything appertaining to the plant at the New Winning being of the most efficient and substantial description, no further outlay will be necessary except for ordinary repairs during the next fifty years at least, and the whole of the gottable coal in the submarine area of 3,200 acres can be drained and raised without any further expenditure for new steam machinery.

The construction of a mile of new railway, from the present terminus at the Queen Pit to the New Winning, is in progress, and will soon be completed. Two new and powerful locomotives have been added to the rolling stock, and the arrangements for shipping the coal have been greatly improved during the last few years. It may be safely asserted that the Sydney Mines will, in the course of a year or two, be the most complete mining establishment in the dominion. The Sydney Mines also possess another advantage which must be noticed ; being situated near the mouth of the harbour, the shipping-place is seldom closed by ice before the first of February ; and generally opened before the first of April, except, occasionally, when the drift ice from the Gulf of St. Lawrence is forced into the harbour by an easterly wind. The upper part of the harbour, near the town of Sydney, where the wharves of the two other principal mining establishments are situated, generally freezes up two or three weeks earlier in the winter, and the ice seldom breaks up before the middle or end of April in the spring.

Great improvements have also been made at the Lingan Mines since 1857. These consist, chiefly, of a railway one mile in length, from the pit or slope to the harbour, which is worked by a small locomotive ; additional shipping places ; and houses for the manager, clerks, overmen, and workmen. The harbour also has been deepened by dredging to allow vessels drawing fourteen feet of water to cross the bar at spring tides.

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* A pair of engines of exactly the same dimensions have been also erected by the General Mining Association at their collieries at Pictou.

Vessels drawing more than fourteen feet have to receive a small portion of their cargoes from lighters outside the bar, but this inconvenience will soon be overcome by a few months' dredging. The good character which the Lingan obtained a few years ago as a gas coal was, unfortunately, lost in 1869 and 1870 from a want of proper care in picking out the iron pyrites found in some parts of the seam, but it is gratifying to learn that, by more careful management, the Lingan coal has now recovered its former good reputation in the United States.

The machinery, wharves, rolling stock, and general equipment of the colliery are in good order, and capable of producing from 70,000 to 80,000 tons per annum. This may be increased, by a moderate outlay, to any amount likely to be required, as the General Mining Association has obtained leases of two submarine areas of 3,200 acres each, on the coast between the north head of Indian Bay and the Low Point lighthouse—one adjoining the Lingan works, the other at the Barasois, two miles to the westward. Workings have been opened in the first by means of a continuation of the Lingan Slope to the dip under the sea; and in the latter, by driving a slope from the surface near the Barasois Pond in the seam called the 'Barasois Seam,' in the Lingan section (p. 23) The length of this slope is 370 yards; both coal and water are drawn by a high-pressure engine of thirty horse-power. When this colliery is fully opened out, its produce can be sent for shipment to Lingan Harbour, by a railway two miles in length; or to Sydney Harbour, by a line three miles in length, in connection with the railway of the Victoria Colliery at Low Point.

The following schedule of the principal items of the property of the General Mining Association in Cape Breton will, it is hoped, give the shareholders a tolerably correct idea of the great extent and value of their possessions. It will also clearly prove that, when the coal trade revives under a more liberal tariff in the United States, the Association will be prepared, not only to supply any reasonable quantity of coal that may be required from their present works, but also to open at least half-a-dozen new collieries, if necessary, within

a short distance of commodious harbours, for the shipment of their produce.

Schedule of Property of the General Mining Association in Cape Breton.

1. ACREAGE OF COAL AREAS UNDER LEASE

			Acres.
Point Aconi, and Sydney mines, area G. M. A.	(1)	on Map	11,700
Lingan " " " " "	(2)	"	8,420
Bridgeport " " " "	(3)	"	1,280
Sydney mines, submarine " " "	(4)	"	3,200
Barasois " " " ' "	(5)	"	3,200
Lingan " " " " "	(6)	"	3,200
		Total	31,000

2. QUANTITY OF COAL IN ABOVE AREAS.*

In Area G. M. A. (1).

	Acres	Thickness		Tons	Totals.
In the Bonar Seam	294	7	3	3,197,250	
" Stubbert "	890	7	3	9,678,750	
' Crawley "	1,813	7	6	20,396,250	
" Mill Pond "	4,099	4	0	24,594,000	
" Black Rock	5,202	4	0	31,212,000	
". Lloyd's Cove	552	6	0	4,968,000	
In the Main Cove .	150	6	0	1,350,000	
" " .	2,154	4	0	12,924,000	
" "	Six-feet Seam Pillars			1,300,000	
Indian Cove .	6,498	4	8	45,486,000	
					155,106,250

In Area G. M. A. (2).

	Acres	Thickness		Tons	
the Carr Seam .	280	4	0	1,680,000	
Barasois " .	540	8	8	7,020,000	
Dunphy " .	690	4	0	4,140,000	
David " .	990	7	0	10,395,000	
Main " .	1,840	8	8	23.920,000	
					47,155,000

In Area G. M. A (3).

	Acres	Thickness		Tons	
In the Back Pit Seam .	562	4	6	3,793,500	
" Phelan " .	1,050	8	0	12,600,000	
" Spencer " .	1,185	6	9	12,998,125	
" McRury " .	1,280	4	0	7,680,000	
					37,071,625

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* Coal contained in seams less than four feet in thickness is not included.

In Area G. M. A. (4).

	Acres	Thickness		Tons	
In the Lloyd's Cove Seam	1,650	6	0	14,950,000	
,, Main " "	3,200	6	0	28,800,000	
, Indian Cove "	3,200	4	8	22,400,000	
					66 150 000

In Area G. M. A. (5).

	Acres	Thickness		Tons	
In the Carr Seam .	. 3,100	4	0	18,600,000	
" Barasois "	. 3,170	8	8	41,210,000	
" Dunphy "	. 3,200	4	0	19,200,000	
" David "	. 3,200	7	0	33,600,000	
Main "	. 3,200	8	8	41,600,000	
					154,120,000

In Area G. M. A. (6).

	Acres	Thickness		Tons	
In the Carr Seam	. 2,480	4	0	14,880,000	
Barasois "	. 2,720	8	8	35 360,000	
Dunphy "	. 2,900	4	0	17,400,000	
" David "	. 3,110	7	0	32,655,000	
Main "	. 3,200	8	8	41,600 000	
					141,895,000
Grand Total . .					601,587,875

3. REAL ESTATE. (FREEHOLD.)

	Acres
Lands containing Coal leased to the Association . . .	4,734
" " " to others	2,377
" not leased	208
Lands outside limits of the Coal-Field in various parts of the Island	6,039
Total quantity of land belonging to the General Mining Association	13,358

4. RAILWAYS, ROLLING STOCK, WHARVES, ETC.

There are at Sydney and Lingan mines six miles of railway, five locomotives, and about three hundred coal waggons and trucks: eight loading berths at the Sydney and three at the Lingan shipping places: and several miles of light railway underground. with a full equipment of coal tubs and trams, at each colliery. Also about one hundred horses, of which about three fourths are employed in the pits.

5. FIXED STEAM ENGINES.

Under this head are comprised two pumping engines of 240 and 150 horse-power; two winding engines of 160 and 60 horse-power; two combined pumping and drawing engines of 30 horse-power each; two underground drawing engines of 30 horse-power each; two sinking engines of 30 horse-power each; and one foundry engine of 24 horse-power which also works the lathes, planing-machines, boring mill, &c.; making a total of eleven steam engines of an aggregate force of 814 horse power.

6. BUILDINGS.

Consisting of 200 dwelling-houses for manager, clerks, overmen, and workmen; twelve shops for engine-fitters, blacksmiths, and carpenters; six stone and brick engine-houses; one iron foundry; twelve stables and barns; six warehouses; and four school-houses.

In addition to the above there are, at the Sydney mines, cupola furnaces, lathes, planing and screw-cutting machines, a boring mill, a steam hammer, and all the tools and implements required in the construction and repairs of steam engines and other mining machinery; and, at the Lingan mines a steam dredger for deepening the harbour, and a steam tug for towing vessels.

It may safely be asserted that, with such extensive areas, containing some of the most valuable seams of coal in the island, and with such a complete plant and equipment, capable of raising any quantity of coal that may be required, the shareholders of the General Mining Association, as soon as they obtain a market for their produce, will again receive the dividends which they enjoyed before the abolition of the Reciprocity Treaty. This market, it is confidently expected, will soon be obtained, as a resolution admitting coal duty free into the United States, adopted by a large majority in the House of Representatives, was only lost in the Senate owing to the want of time to discuss it immediately before the close of the last session. This resolution, most probably, will be again brought forward in the early days of the approaching session of Congress, and passed, to the advantage alike of the producers of coal in the British Provinces and of consumers in the great cities of the Atlantic seaboard of the United States.

CHAPTER XII.

Having in the last two chapters furnished the reader with brief descriptions of the present condition and capabilities of the coal mines now open in Cape Breton, it is hoped that the information embodied in the Tables Nos. V. and VI., compiled from the annual returns of the Government inspector of mines, and other authentic sources, will enable him to form a tolerably correct idea of the great importance and progress of the coal trade since the year 1858, when the General Mining Association surrendered their rights to a great portion of the coal-fields; and several new mines in consequence came into operation.

The figures in the tables speak for themselves, but a few remarks will, nevertheless, be necessary to explain away some apparent anomalies. In the first place, going back to Table IV., it will be seen that, in 1857, before any new mines were opened, the total sales of Cape Breton coal, including small coal, were 126,549 tons, being an advance of 27,223 tons upon the sales of 1854, the last year previous to the admission of coal into the United States free of duty under the Reciprocity Treaty. This advance, it must be observed, was almost wholly due to the increased consumption in the British Provinces, and not to the effect of the abolition of the duty in the United States.

2. Up to the close of the year 1861, the increase in the sales was not material, being only an advance of 27,673 tons upon those of 1857. mostly due to the introduction of Lingan coal into the New York Gas-Works, and a small export from the new mines, which, previously to the former date, had not got into full operation.

3 In 1862, the exportation of coal from the new mines began to be sensibly felt, the sales having reached 36,699 tons In the same year, the sales of the Sydney and Lingan mines amounted to 145,874 tons, being an advance of 10,116 tons upon those of the preceding year.

4. During the years 1863, 1864, and 1865, rapid progress was made in the sales of Cape Breton coal, which advanced from 182,583 in 1862, to 424,552 tons in 1865. This great increase was, as will be seen by Table V., chiefly owing to the introduction of the new

mines coal into the gas-works of the United States. The Lingan mines participated to a large extent in the active demand for gas coal, the sales having advanced from 4,942 tons in 1858, to 55,108 tons in 1865; but the Sydney coal being almost wholly used for domestic purposes, and unsuitable for gas-making, did not share in the prosperity of the neighbouring mines; on the contrary, the consumption of Sydney coal in the United States gradually declined, owing to the almost universal use of anthracite. The total sales of the Cape Breton mines in 1865—their most prosperous year amounted to 424,552 tons, towards which the Sydney and Lingan contributed 163,687, and the new mines 260,865 tons.

5. After the expiration of the Reciprocity Treaty in 1865, the sale of Cape Breton coal in the United States rapidly declined to 355,000, 318,000, to 256,000 tons. in the years 1866, 1867, and 1868, respectively.

6. During the last two years—1869 and 1870—there has been a slight improvement in the trade, although the duty has not been reduced. This apparent anomaly can be easily explained. Previous to the year 1865, when coal was admitted duty free, the mining companies were able to sell their coal at remunerative prices; but when the duty of five shillings per ton was imposed, it was found impossible to deliver the coal in the United States at such a rate as would secure a market without making considerable reductions in the selling prices at the mines. In consequence of these reductions, some of the mines, which in former years paid handsome dividends, have during the last three years made no profit whatever, but their owners have continued their operations solely with the view of retaining their customers, in the hope of being able, when the duty is taken off, to advance their selling prices. It is reported that some of the companies are selling their coal this year (1871) at six shillings per ton, which, it is presumed, can be done without loss; therefore, taking the average freight at ten shillings per ton, and the duty at five shillings, the coal can be delivered in the United States at twenty-one shillings per ton. When the duty is taken off, if the coal owners raise their selling price to eight shillings per ton, which would leave a moderate profit, the coal can then be delivered in the

United States at eighteen shillings per ton. We may therefore reasonably conclude that if the Cape Breton mines found a market for 144,751 tons of coal (see Table VI.) in 1870 at a cost of twenty one shillings, there is every prospect of selling a much larger quantity when the coal can be delivered at Boston or New York at the rate of eighteen shillings per ton. Since the abrogation of the Reciprocity Treaty, the gas-works of the United States have been supplied chiefly from the mines of Pennsylvania, Maryland, and Virginia, at an enhanced price to the consumers, but, when colonial coal is admitted duty free, the coal-owners of Cape Breton will be able to deliver their coal at lower rates, the cost of sea freight being considerably less than that of land transportation. This will naturally lead also to an increased consumption of coal, as gas-works will be established in places which hitherto have been debarred from using gas, owing to the high price of American coals.

Independently of the increased demand which may be looked for in the United States. there is every prospect of a rapidly improving trade with the neighbouring British Colonies. By reference to the annexed Table VI., showing the quantity of coal sold in each of the colonies separately, it will be seen that the total sales of large and small coal amounted in 1870 to 171,727 tons, being an advance of 70,446 tons upon the sales of 1857, and more than three times the quantity sold in 1850. (See Table IV.). As Canada and Prince Edward's Island are quite destitute of coal, and New Brunswick and Newfoundland contain only some thin seams of no economic value, all these colonies must look to Nova Scotia and Cape Breton for supplies of fuel for steam, domestic, and manufacturing purposes. Canada, it is true, receives a considerable quantity of coal from Great Britain (131,000 tons in 1869), in the form of ballast for ships employed in the timber trade; but this cannot last long, because the consumption of coal in England is increasing so rapidly that all the most accessible seams are nearly exhausted, and the selling price must advance in the same ratio as the difficulty of working. For the same reason, it is probable Cape Breton will ere long enjoy a share of the markets of the West Indies and South America, at present entirely supplied by Great Britain. In the year 1869, the exports to those countries were as follows:—

	Tons
To British West Indies	134,969
" Foreign "	369,763
" Brazil "	230,143
" Uruguay	167,821
" Argentine Confederation	66,513
Total	969,209

Cape Breton will, in this case, enjoy peculiar advantages from her geographical position and the proximity of her mines to the seaboard. Situated in the centre of the colonies, and within a reasonable distance of the United States, the harbour of Sydney is undoubtedly destined to become the great emporium of the coal trade.[*] This harbour, universally admitted to be one of the best in America, has a clear width of two miles, and a depth of ten fathoms at its entrance. Five miles from the lighthouse, the main channel divides into two arms or branches, one running westerly, the other southerly, protected from the sea swell by sand beaches jutting out from each shore, which contract the channel to a width of three-fourths of a mile. These branches each about five miles in length, would afford anchorage for all the navies of Europe. Everywhere within the beaches there is deep water close to the shore. Commodious wharves, in connection with the coal mines, have been erected at three places—one on the south side of the harbour,[*] where vessels of the largest burthen can load at low water.[†] The harbour of Sydney, being free from rocks and shoals, and the dense fogs

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[*] The following table shows the distances from Sydney to some of the chief ports in the Colonies and the United States:—

	Miles
From Quebec (Canada)	720
" Miramichi (New Brunswick)	300
" St. John's (Newfoundland)	400
" St. John's (New Brunswick)	540
" Halifax (Nova Scotia)	240
" Portland (United States)	580
" Boston (" ")	600
" New York (" ")	750

[*] The Glasgow and Cape Breton Mining Company are erecting a wharf, also nearer the town of Sydney, in connection with their works.

[†] The difference between high and low water is only six feet in spring tides.

which often envelope the southern coast of Nova Scotia. can be approached at all times without danger, and entered with every wind. In proof of this last assertion, it need only be stated, that, some years ago H. M. S. 'Wellesley,' of seventy-two guns, bearing the flag of the late Earl of Dundonald, beat up the harbour, from its entrance to the head of the south arm, against a stiff breeze directly ahead.

Situated almost on the direct route from Europe to Canada and the United States, Sydney must soon become the great coaling station for steamboats, which will, ere long, entirely supersede sailing vessels for passengers and the conveyance of the more valuable class of merchandise. The only obstacle to the realisation of this object is the fact that the harbour is closed by ice during the months of February and March, and part of April; but this may be overcome by supplying steamers during those months with coal from the Port of Louisbourg, which is open all the year, and only eighteen miles distant from the eastern portion of the coal-field. There is every reason to believe that, in the course of a year or two, an uninterrupted line of railway will be formed between Halifax and San Francisco, by the completion of the Inter-colonial line, connecting the port of Halifax with the European and North American Railway. New York will, by this route, be brought twenty-four hours nearer to Europe than by the present lines of steamers running direct to New York; and as the gain of every hour is an object of great importance, a still further saving of six hours may be effected by continuing the Inter-colonial line from Pictou to Louisbourg—a distance of about one hundred and thirty miles. The opening of the navigation of the St. Lawrence to American vessels, under the Washington Treaty, will be the means of placing lines of steamers on the direct route from Chicago to England, which will find their advantage in coaling at Sydney on their outward and return voyages, as they can then carry much larger cargoes of merchandise, having, on leaving Liverpool, to take in only as much coal as will carry them to Sydney, where they will get a fresh supply to carry them up to Chicago and back to Sydney. By this arrangement, which will be highly advantageous to steamboat owners, the Sydney mines will supply two-thirds of all the coal required for making the outward and home voyages. By this arrangement they will also obtain the fuel required, at Sydney for eight shillings per ton, against at least sixteen shillings per ton in all the English ports, except those which supply steam coals, very few of which have any direct trade with the United States. It is needless to dwell upon the immense advantages which must accrue to the owners of the Cape Breton Collieries by this course of trade, and the great extent to which it may be carried.

It is well known that coal is the basis of the prosperity of Great Britain, and of the success of her manufacturing enterprise, which has converted districts, once barely habitable, into seats of active and profitable industry.* When her coal seams are exhausted, the bulk of her population will be compelled to emigrate, while those who remain will have to live upon the cultivation of the soil. Professor Jevons, in a work 'On the Coal Question,' published in 1865, estimated that the rate of growth, at that period, in the aggregate annual consumption of coal, amounted to about three and and a-half per cent. per annum, reckoning each annual percentage on the previous year's consumption. Calculating upon the consumption of 1865, namely 98,150,587 tons, he estimated that the whole quantity of available coal in Great Britain would be exhausted in 110 years. The Royal Commissioners appointed to enquire into the matter have just published their report, in which they impugn Professor Jevons' estimate. They state that the total available quantity of coal in the United Kingdom is 146,480 millons of tons, which, according to the estimate of Mr. Price Williams, who has given great attention to questions of this kind, will be exhausted in 360 years. Although the exhaustion of the English coal-fields is still far distant, the best and most accessible seams only have been worked, and have, in consequence, suffered great diminution. Those which remain must be worked at a greater cost, and coal can only be supplied to manufacturers at enhanced pri ces—prices liable to be still further increased by the action of the trades' unions, at present so rampant in Great Britain. If these unions succeed in curtailing the hours, and advancing the price of labour, it will be impossible for employers to hold their own in competition with other countries, and they will be compelled to take their capital to America where they will find more suitable places for pursuing their vocations in the vast, almost untouched, coal-fields of Indiana and Illinois. Happily, some may find their way to Cape Breton, only seven days distant from England, which offers most favourable conditions for the introduction of the cotton manufacture, possessing a healthy temperate climate, cheap food, a hardy industrious population, and vast deposits of coal of the best quality Even at the present time many articles of general consumption in the colonies may be manufactured and sold to advantage, being protected by a duty of fifteen per cent on foreign productions. For instance, salt, an article indispensible in curing fish, might be made from the brine springs of St. Patrick's Channel, in the very centre of the prolific fisheries of cod, mackerel, and herring, in the seas which surround the island. The fishermen would then obtain their salt at first cost, unburdened with freight and expenses attending its importation from England, and the coal-owners would find a market for their surplus produce of small coal, now in a great measure unsaleable. The manufacture of iron might also be successfully established, for although no valuable beds or veins of iron ore have been discovered in the island, an inexhaustible supply of rich magnetic ore could be obtained from the extensive deposits in the rocks of the Laurentian series of Canada, between the river Ottawa and the Rideau canal. Great quantities of this ore are now sent by the Rideau canal to Kingston, and thence by lake and canal navigation to the iron-works at Pittsburg on the Ohio. Surely, it could be delivered at a less cost in the ports of Cape Breton, as the vessels employed in transporting it would have return cargoes of coal to Quebec Montreal, and other towns on the St. Lawrence.

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* Lancashire, which a few centuries ago was looked upon as a kind of morass or waste. and one of the poorest counties in England, now, owing to its coal mines, has a population of 1,230 persons to the square mile, while the principal agricultural counties have only from 148 to 230 persons to the square mile.

With so many favourable conditions of the establishment of various manufactures. with cheap land in suitable situations for the erection of works, with abundance of timber, freestone, granite, limestone, and almost every article required in the construction of manufacturing premises, and, above all, with cheap fuel of the best quality, there is every reason to conclude that ere long Cape Breton will become a prosperous manufacturing country, and absorb the labour of its redundant population, now compelled to seek for employment in the United States and the neighbouring colonies. With all these advantages, in addition to its admirable geographical position as a coaling station for steamers navigating the Atlantic, the island of Cape Breton, we may safely prophecy, will before long become one of the most prosperous portions of the New Dominion.

APPENDIX.

DEVELOPMENTS SINCE 1870.

Mr. Brown's history of coal mining in Cape Breton comes down to the year 1870 The details given by him of the opertions of the "new" mines serve in a general way to show the extent of their development up to that date. As the period embraced between the years 1870 to 1893, nearly a quarter of a century, may now be considered also as ancient history extensive notes of the progress of the individual collieries are not called for. Since 1858, no less than twenty mines, large and small, had been opened and worked to a greater or less extent; now there are eight, not counting the mine recently opened at North Sydney.

In many cases the operators were not possessed of means as adequate to equip their mines as those of their wealthier competitors; and others found it useless to attempt to force an entry into markets already abundantly supplied with Cape Breton coal. It was a case of the survival of the fittest. The Block House dropped out of the race when it had exhausted the main seam in its land area. The Sydney and Louisburg abandoned a number of its collieries, and practically confined itself to the Reserve Mine. The General Mining Association withdrew from the Lingan Colliery. Finally in 1892 the trade was practically in the hands of the following companies :—

The General Mining Association.
The Sydney and Louisburg Coal Co.
The International Coal Co.
The Glace Bay Coal Mining Co.
The Caledonia Coal Mining Co.
The Gardner Coal Co.
The Low Point, Barasois and Lingan Co.
The Messrs. Archibald.

It is understood that most of these mines were making returns for their owners by dint of great economy in working, management, etc. Their exertions had been seriously handicapped for a number of years by the continued decline in the price of coal. Added to this the extension of their workings, the increasing strain on their machinery, and the difficulty of securing regular and cheap freight rates, all combined to make the coal manager's life anything but a happy one.

The state of affairs in this coal field required but ordinary prophetic gifts to see that a few years would still further reduce the number of producers, and forced the consideration of some measure of consolidation, as a possible alleviation of the troubles present and future. Finally the attention of Mr. H. M. Whitney, of Boston, was drawn to the possibilities of the district.

From a business point of view there was directly visible certain economics in lessened costs of management, agencies, stores, and shipping. Consolidation of control would permit of saving of time during the shipping season, and of contracts made without ruinous competition, etc. In addition the accession to power of the Democratic party in the United States apparently promised an abolition of the coal duties. Gradually the scheme took effect, and after many negotiations a form of lease was agreed on between the syndicate and the Provincial Government.

It was found that the system of leasing the coal areas provided for by the mining law was not acceptable to investors. The system then and still in vogue is that the leases should be granted for four terms of twenty years each, and that the government could rearrange the royalty. Finally a ninety-nine year lease was granted, on condition that the royalty would be 12½ cents per ton of coal sold instead of 10 cents, coupled with a provision for a fixed minimum royalty. The lease in other respects followed in general terms the ordinary leases issued by the Department of Mines. As there is little doubt that the cost of putting coal on the cars in this coal field can be reduced by proper management to the vicinity of 50 cents per ton, the royalty of 12½ cents is pretty high in comparison. In this respect the government drove a good bargain.

The Acts of 1893, Legislature of Nova Scotia, contain the legislation, lease, and charter organising the Dominion Coal Company. Its capital was placed at $18,000,000.00 with $3,000,000.00 of bonded indebtedness. It acquired the following going mines, Gowrie, Caledonia. Reserve, International, Old Bridgeport, Glace Bay, Gardner and Victoria, and a number of other areas. These were included in the long term lease and covered about seventy-eight square miles. The company subsequently purchased the Block House property, and other areas, and acquired coal rights from the government, averaging about fifty-five square miles. These are not included in the special lease, and are held on the same terms as the properties of other coal owners.

Negotiations were said to have been entered upon for the purchase of the property of the General Mining Association at North Sydney, however, this company has remained outside of the consolidation. The Dominion Coal Company now owned all the going mines in the Sydney coal field, outside of the General Mining Association and large tracts of land necessary to round out its territory. This gave them all of the two large districts of Lingan and Glace Bay and a large part of the Cow Bay district.

At this time the Caledonia and Glace Bay mines shipped at Glace Bay where an artificial harbor had been excavated by the latter company, the Caledonia having abandoned its harbor at Big Glace Bay, and paid a toll of 12½ cents per ton shipped. The International company shipped its coal and that from the Old Bridgeport, and Gardner mines at its pier on Sydney Harbor. The Reserve and Emery coal was shipped at their Sydney pier. The Victoria colliery had its own railway connecting with a pier at South Bar. The first step of the new company was to consider its future course.

The problem of transportation and shipment was an important one. The short summer season available for sending coal up the St. Lawrence, the principal market, necessitated a system capable of collecting coal readily from the various mines, of transporting it cheaply and of shipping it rapidly. In order to effect this the International railway and its pier was selected as the principal outlet. The pier was enlarged and improved so that it has 35 feet of water, at low tide, at its outer end, and, by the adoption of a gravity system can load 7,000 tos. of coal in 24 hours. It is provided with two towers for lowering coal into the vessels in large buckets to prevent breakage, lighted with electricity, etc. As the bunkering of steamers calling for coal necessitates the stoppage of the regular loading into charter boats, etc, another pier was constructed beside the main one capable of loading five thousand tons in twenty four hours.

The International railway, altho very favourable as regards its grades and curves, was railed and equipped for a business much smaller than that now thrown upon it. It has been relaid with heavier rails and brought up to good order. Branches were laid from it to connect with all the pits, and then the Sydney pier and Glace Bay were abandoned as coal shipping points. The original scheme contemplated the utilisation of Louisburg as a supplementary shipping place, and for the United States trade. A narrow gauge road had been built, a number of years ago, by the Sydney and Louisburg company to this harbour from its system of mines. The grades of the road, its location, and approach to the wharf were not well designed and the road had been practically abandoned.

The International railway has been extended to a point on the western shore of the Harbor, with the most favorable grades available. It is laid with heavy rails and is in every respect superior to the Government specifications. The wharf is capable of shipping 4000 to 5000 tons a day and is similar in construction to the new wharf on Sydney Harbor.

On taking over the property the Emery and Gardner mines were closed. Apparently the policy of the company contemplated the extensive working of the Phelan seam, one of the largest they owned, well adapted for steam, domestic, and coke purposes, and of the Harbor seam which yields a coal with good gas values. As all the coal in the land area of the harbor seam, hitherto worked by the Glace Bay and International collieries, could be more profitably extracted through the latter mine the Glace Bay, or Stirling pit, was closed.

The Hub seam, the highest in the Glace Bay series, has a small land area, a large portion of which was worked out a number of years ago, and the workings closed. As there was, in addition to the coal remaining in the land area a large extension under the sea, and the coal had established a good reputation as a gas coal the company reopened the old mine and are now driving into its sub-marine extension.

In the Phelan seam the workings of the Caledonia, Reserve, and Old Bridgeport collieries were extended, and a new pit, called Dominion No. 1, sunk to the north of Old Bridgeport.

The extension of the workings of the Reserve and Dominion Collieries has practically closed the yield of the Old Bridgeport mine, and before long its days will be numbered.

The Victoria mine was recently closed by the Company, as its working expenses were higher than those of the other mines. The quality of the coal was unexceptionable. It is understood that as soon as the demands of the coal trade will permit, this seam will be opened further to the eastward, where it lies at a flatter angle, and that then, instead of having a separate pier, it will be connected with the main line and its product be shipped at the International pier. No doubt it will then prove, as in the past, to be in demand for bunker purposes. The Gowrie Colliery, at Cow Bay, for many years operated by the Messrs Archibald, has also closed, it is understood because the quality of coal it produced could be more cheaply supplied and shipped by the collieries opened on the Phelan seam.

The pits now in operation by the Dominion Coal Co. are fully equipped with all modern appliances for the cheap and rapid extraction, screening and shipment of coal. Endless rope haulage has been extensively used.

Compressed air is largely used for driving pumps, heading, coal cutting and boring machinery. At most of the mines the shafts are provided with cages from which the tubs automatically dump their contents without being removed from it and returned. Picking belts, rotary screens, etc, are used so that the coal may be rapidly cleaned and classified. It is claimed that a saving in cost is effected by the employment of coal cutting machines of the percussive type, the full results however may not be finally decided for some time to come.

The Dominion No. 1 Colliery, has been designed, opened, and operated as a mine worked exclusively by machinery, as no coal is cut in it by hand, in the regular mining. The following details of its machinery etc are of interest:—Depth of shaft (24 feet by 10 feet 6 in) 150 feet. System of working bord and pillar, pillars 12 ft, bords 22 ft.

Ventilation—One 12 ft Murphy fan, running direct and producing 120,000 cubic feet of air.

Boilers—Four Babcock, each 200 h. p., working at 100 lbs pressure.

Winding engine—One pair 24 by 24 inch cylinders, 8ft drum, built by Smith & Co, Airdrie, Scotland.

Man Engine.—16 by 30 inch cylinder.

Air compressors.—Two, Ingersoll Sargent Compound, each 48 by 30 inch cylinder, with Corliss valves.

Pumps.—One Cameron, 18 by 24 inch cylinder

Haulage Engines—Two, 18 by 36 inch cylinders, for driving endless haulage.

Slackpocket, elevator, and conveyor. Self dumping cages, self weighing tanks, shaking screens and picking belts.

Steel lattice pit head frame, 85 high. Brick engine and boiler houses etc.

The collieries of this company are capable of producing 8,000 tons a day. The following figures show the production of the company for the years 1892 to 1898.

COAL PRODUCE OF THE DOMINION COAL CO. FROM 1892 TO 1898, IN TONS.

DATE.	TONS.
1892	842 970.
1893	652 833.
1894	950 683.
1895	905 671.
1896	1 079 198.
1897	1 252 484.
1898	1 155 311.

A contract has been entered into with the Boston Gas Company, at Everett, calling for about 800,000 tons of coal annually, to be heated in retort ovens. It is proposed that the gas will be used for illuminating and engine purposes, the coke for house, and metallurgical services, and that the products of sulphate of ammonia, tar, etc, etc, will find a ready market.

As the coals worked by this company produce a coke adapted for metallurgical purposes it is confidently expected that at no distant day will be seen the establishment of a large iron smelting plant near Sydney. It is stated with every show of reason that pig iron, of good quality, can be made here more cheaply than in the Southern States of the American Union, a locality making this article cheap enough to permit of its exportation to European markets. Experiments have proved that the coals of the Sydney district make an excellent coke, running up to 90 p. c. in carbon, and not exceeding 8.5 p. c. of ash. In quality it may be ranked with the famous Connelsville, the standard coke of the world, and as superior to all other American cokes.

A large Robertson washer with extensive storage bins has been erected by the Company, and the quality of the slack has been vastly improved by being passed through it. This washed slack has been extensively used in the retort ovens of the Halifax Heat and Light Co., for a steam fuel it is preferred by many steamship-lines, and is finding its way into United States ports as an acceptable fuel for steam raising, lime burning etc. The percentege of coke secured by practical tests from the International coal is as high as 71 per cent. These tests have shown that the coal yields in addition 7.57 gals of tar, 30.75 lbs of sulphate of ammonia, and 10,390 cubic feet of gas, per ton.

THE GENERAL MINING ASSOCIATION.

The History of the General Mining Association is most fully given by Mr. Brown down to the date of the sinking of the new winning at Cranberry Head. This establishment was designed for the working of the Sydney main seam in a large submarine area.

This sinking was carried on during 1867. There were two shafts, circular in form, the pumping shaft being 11 feet and the hoisting shaft 13 feet in diameter. The following year heavy feeders of water were encountered, and sinking was interrupted to permit of the erection of a heavy pumping engine. During the year 1869 operations were continued in the old workings and covered under the sea about 12 acres on the northern side of Cranberry Head and about 22 acres under Lloyd's Cove. The following year saw the sinking still uncompleted. The output which was maintained at its usual figure was principally from the submarine workings and the old pillars.

In 1872 the pumping shaft reached a depth of 266 feet when a feeder of salt water was struck running 160 gals. per minute. The sinking was discontinued and the lower 32 fas. of the shaft lined with cast iron tubbing. The pump shaft was sunk to 280 feet and 25 fas. lined with tubbing. The massive pumps were completed and other work done.

In 1874 the output contracted principally owing to the accumulation of water in the workings. It had been anticipated that the new shafts would have been finished long before this date and the water removed. The delay in sinking, however, caused the accumulation of much more water than anticipated.

In November the main seam was reached, found to be six feet thick and of good quality. A branch railway was completed, a new wharf started and matters generally brought up to line with the new and magnificently equipped colliery. The following year more tubbing was put in the shafts, and at the present day they are dry and in good shape.

The year 1876 was noted for a strike, lasting from May 27 to August 1st. The total length of shaft tub-bed was 842 ft. 9 inches, and the weight of the iron was 1,552,338 lbs.

In 1878 the new colliery may be said to have got well under way, after a long, and tedious sinking. The new shafts were the scene of a serious explosion on May 21st by which six men including the manager, and overman, were killed. The enterprise of the general manager Mr. Brown, was next shown by the erection of a Guibal fan, the first mechanical ventilator in Cape Breton.

During the year 1882 the output was 156,758 tons. The system of underground haulage was found to work well, and the planes were rapidly extended. The utilisation of the Queen pit shafts for ventilation was found to secure a good air current

For several years matters continued smoothly at this mine. The admirable system of working being followed regularly. In the spring of 1885 operations were interrupted by a serious fire in the workings, the cause of which was never clearly explained. After using every exertion to put the fire out it was found necessary to take the water lying behind the tubbing and to fill the district in which the fire was. This was necessary as the fire was rapidly approaching the pit bottom. During this year an opening was made with the Franklyn submarine area and coal extracted. The output was 124,274 against 149,378 tons in 1884.

During the following year a great part of the water was pumped out, and the remainder was removed by degrees.

It was estimated that 74,000,000 gals. were used to extinguish the fire.

In 1887 the workings in the Franklyn area were suspended in the higher levels as there was a leakage of salt water. As there is a good cover at this point it would appear that the water may have been a sign of approach to the disturbed ground supposed to mark the change from the low dip of the Sydney seams to the deep pitch of the Victoria coal beds. The output was 170,782 tons. During the year 1889 extensive repairs were made to the surface plant, and a new force pump installed at the pit bottom to force direct to the surface against a head of about 700 feet.

These improvements were followed by others underground. The engine ways were widened and travelling roads opened so that the men could be kept off the engine planes as much as possible. The ventilating appliances and airways were enlarged, electric lights introduced etc. The development of the underground workings of this mine have not been specially referred to as no startling changes have been made since it was opened. Prior to the sinking of the Cranberry Head pit a plan of underground development and mining was drawn up by a prominent English mining engineer and it has since been followed with little change.

Roughly speaking in addition to the working to the rise contemplated from the levels driven north and south from the pit, the scheme, as far as regards the dip coal, was that the pit should have two main angle dips running obliquely from the pit and furnished with shorter transverse dips. The whole being designed for a combined tail rope and gravity haulage system.

This system has been gradually extended until the face of the north slant is a mile and a half from the pit bottom. A large acreage in this pit is standing in pillars the extraction of which has been commenced. On the surface continual improvements have been made until the colliery combines the best features of English and United States coal mining practice. A short time ago a 600 feet shaft was sunk intersecting three workable seams, of good quality, and from 4 to 5 feet in thickness. In addition the company owns a large tract of coal land extending to the Big Bras D'or and containing many valuable seams of coal. It has therefore as far as its coal supplies are concerned a long future before it, as well as its past history of nearly three quarters of a century as the pioneer coal mining company of the Province. The production of the colliery last year was 273,904 tons, so that the competition of the Dominion Coal Company has not prejudicially affectd it.

THE NORTH SYDNEY MINING AND TRANSPORTATION CO'Y.

When the General Mining Association renewed their leases in 1886, they relinquished a narrow strip on their western boundary. The strip runs about two and a half miles back from the shore and contains nearly a square mile. This covers the seams known in the Sydney Mines district outside of the main seam. On this strip the North Sydney Mining and Transportation Company opened a small mine in Barrington's Cove, and built a coal wharf, suitable for shipments by small vessels.

A level was driven into the seam and a few workings extended to the crop. Operations have been continued on a small scale up to this summer when it has been decided to close this working, and to open a pit on the Montcrief property about a mile to the north west of the present opening, to work the seam of coal underlying the No. 3 seam, known as the six feet or Greener seam. Arrangements are being made for rights of way through the town to a shipping point a short distance from the General Mining Association's pier. This company will then be in a favorable position to compete with its larger and more ambitious rivals, as hitherto it has been much impeded by the exposed position of its wharf in Barrington's Cove.

No work has yet been done on the areas lying west of the General Mining Association, extending from North Sydney to the Big Bras. D'Or. There are a number of areas containing coal, some of which have been worked to a small extent. No doubt the promised expansion of the coal trade will bring them into notice.

THE NEW CAMPBELLTON COAL FIELD.

This district isolated from the Sydney coal field by the Big Bras D'or is really a continuation of it. It, however, presents certain peculiarities which have attracted much attention from local geologists. We see in the main coal field largely extending and thick sections of millstone grit, carboniferous limestone, and basal conglomerate, outcropping beneath the coal measures so that they are separated by intervals of several miles from the basal presilurian masses of the Island. In the district, however, which I am referring to faults and other agencies have so limited the outcrops of these horizons underlying the coal measures that one can throw a stone from the syenite to the coal seams.

The land area of the coal measures is limited to the property known as the "New Campbellton," but there is undoubtedly a large extension under the sea.

The labors of the Canadian Geological Survey have shown the equivalence of this district with that to the south as developed by the operations of the General Mining Association on Sydney Harbor.

There have been opened so far in this district three seams of coal, having the following thickness: four feet two inches, two feet, and six feet.

The history of the exploitation of this property presents few points calling for special interest. It shared in the boom caused by the cessation of the monopoly of the General Mining Association and the civil war in the United States, and we find that 120 men were employed in 1863. However operations were suspended for five years until the mine was reopened in 1873. The Hon. Mr. Camphell reopened the mine and worked it continuously on a small scale until the year 1883. The keeness of competition which was induced by the scanty market and the large number of collieries operating in other parts of the coal field, led to a retirement prudent on the part of Mr. Campbell in view of the fact that the remaining collieries kept afloat principally through the exertions of their shareholders resident outside of Nova Scotia, and their larger initial development.

In 1893 the Messrs Burchell Bros. who had for some years operated the Gardner mine at Bridgeport, sold out to the Dominion Coal Company. They acquired possession of the New Campbelton Mine and started bravely on the task of reopening it. During the years of idleness it had become practically a wreck. They have reopened and deepened the slope, refitted the machinery, railway and pier, and have now a snug going concern.

The four feet seam, being most easy of access, has been the scene of their operations. The seam is found to lessen its dip, as followed from the surface, from 16 degrees to 7½ degrees, and also to improve in quality. Explorations, carried on by the proprietors taken in conjunction with the recent developments of the new shaft of the Sydney mines, show that the seams of the magnificent territory of that company, are reproduced on this area. The extent of coal on it has been given by the Canadian Geological Survey at over twenty six millions of tons of coal. This amount the Messrs. Burchell claim is largely increased as the result of their explorations.

The mine at present is capable of an output of from 250 to 300 tons a day, which could be largely increased by a system of endless haulage.

The equipment of the mine may be briefly summarised as follows : a good steel railway to the pier, a distance of one and a quarter mile. The pier with all necessary equipment has a depth of 17 feet of water along side which can be readily increased by adding to its length At the slope there is a large hoisting and boiler equipment for the hoists, shop, pumps, and compressor, the latter capable of supplying power for five coal cutters and for the pumps.

The pump capacity is ample for handling all water met hitherto without being worked to its full capacity. There are all necessary shops, houses, stores, etc.

The quality of the coal worked will appear from the following analysis by Mr. Mason of Halifax :—

Moisture	2·7
Volatile Matter	32·5
Fixed Carbon	57·9
Ash	6·9
Sulphur	1·44

The coal on complete combustion will evaporate 14·31 lbs of water. This shows that it ranks with the best coals of the district, and in common with them it improves as the workings are pushed away from the outcrop. Its sulphur percentage is below the average of the Cape Breton coals.

This property shares in common with Louisburg and Sydney Harbor the advantage of being convenient and near the track of the two great trans-Atlantic routes, of the St. Lawrence and of New York, and is equally on the Atlantic seaboard. It is on the mouth of the Bras D'or Lake ; and Kelly's Cove, the shipping point. is most accessible, and possesses this advantage, that, cargoes, destined for southern and western points, escape the Atlantic by an inland navigation through the Bras D'or Lake, really a salt water arm of the sea, and the Government Canal at St. Peters.

CAPE BRETON OIL SHALES.

For several years Mr. W. N. Young of Boston, has quietly carried on considerable work at McAdam's Lake, East Bay, Cape Breton County, on some large deposits of shale. These shales which are black, and of lower carboniferous age, are very highly bituminised. Trial tests show that they yield readily considerable amounts of oil, available for lighting and lubricating purposes, besides other products among which may be named pitch, tar, ete. It is claimed that the high quality of these products ensures a price in the market much higher than is paid for the equivalent Canadian or United States articles, and that the size of the deposits and the cheapness with which the operations can be carried on render competition useless in the matter of the most valuable products obtainable from the shales. A company has recently been formed, and the erection of a distillery, mining plant, etc. decided on. Should the undertaking prove successful, it will be probably the precursor of a large business of a similar character in other localities.

—APPENDIX A.—

THE CUMBERLAND COUNTY COAL-FIELD.

The presence of coal in Cumberland County was known at an early date, and the annals of the County contain references to measures taken to prevent people stealing it from the cliffs. There were a few attempts made to lease the Joggins seams, but no systematic mining was carried on. The fuel was in request at but few points, as abundant supplies of cheap wood were available, and people generally preferred it as cleaner and more readily handled in the stoves of the day.

The Cumberland coal district is one of the least explored of the provincial coal fields. It outcrops on the shore at the Joggins in a band about two miles wide dipping at an easy angle to the south. Here, altho a clean cut section is exposed in the cliffs, but two seams of workable size are known, the Joggins Main and the Hard Scrabble. The outcrop of the coal seams passes to the eastward under Maccan Station for a distance of about twenty miles, A number of seams have been opened in this section, but hitherto their identification has not been clearly made out. The turn of this section to form the end of the basin has not yet been traced round to the Springhill section. Here a number of large and valuable seams occur folded in around the town of Springhill Recent explorations have continued the course of these seams round to the reverse side of the basin. The southern side of the basin has not yet been followed to its probable re-entrance on the shore near Apple River. The Geological Survey plans show this side of the basin occupied by divisions of the carboniferous other than the productive, but it is probable that more careful examination will show the outcrop of coal seams. There is no doubt that the district lying in the centre of this trough, covered by measures lying above the productive, is underlaid by coal at an unknown depth. Future generations by means of bore holes may be interested in attempting to prove that at some points the coal seams approach the surface within the miner's reach—so far, enough has been done to assume many years output on a scale much larger than the district has hitherto attained.

The General Mining Association during the period of their monopoly worked the Joggins mine on a small scale and were aware of the pursuance of coal at Springhill. When the monopoly of the company was broken in 1858, they retained four square miles at the Joggins, and four square miles at Springhill.

This change in the tenure of the coal lands of the Province led here, as in the case of Cape Breton, to the opening of a number of mines on the Maccan and Hebert Rivers. The civil war in the United States led to a demand for Nova Scotia coal, and a number of American capitalists acquired rights. They opened mines at Maccan, Chignecto, St. George, Minudie, Lawson, Victoria, etc. The district furnished many facilities for these mines, as it was intersected by the Maccan and Hebert rivers which at high tide allowed vessels of medium size to reach points within short distances of the works. The close of the American war and the imposing of a heavy duty soon reduced these mines to an unproductive state. Since that date with the exception of the Joggins, the production of the mines on the northern outcrop has contributed little to the output of the district.

In the year 1865 the anticipation of the railway from Truro to Moncton, led to prospecting in the Springhill district. In 1867 the Black or Eleven feet seam was discovered. Finally in 1872 a company composed principally of St. John capitalists was formed to work the areas here, and a branch line was begun from the 'Junction' The year 1873 saw the commencement of regular operations by the opening of the East and West slopes, and the preliminary steps for the construction of the Springhill and Parrsboro Railway. The coal boom of 1874 stimulated the work of opening the Springhill mines, and also led to much prospecting in that vicinity, and again directed attention to the small mines. A notable event was the sale in 1871 by the General Mining Association of the Joggins tract which was divided between the Joggins Coal Mining Co. and the Joggins Coal Mining Association. The Hardscrabble seam was opened by the former and operations continued for a few years, but as it yielded only two feet nine inches of coal it was not found profitable.

The sales of this county were 14153 tons in 1872, and in the following years 26,345, 49,599, 60,944 and in 1876, 84,528 tons. The St. John fire of June 22nd led to the abandonment of the workings in the Hardscrabble seam. The opening of the Springhill and Parrsboro Railway now promised a new and important outlet to the Springhill mines, but the loss by fire of the east slope bankhead prevented full advantage being taken of it. The scheme of building a railroad from Maccan station to the shore at the Joggins was now mooted and a preliminary survey decided on. It was found that the east and west slopes Springhill, instead of being on the same seam were really on different ones, separated by a few yards of strata and a tunnel was started to connect them to facilitate the underground operations. Since that date the connection of the two seams by tunnels has been continued at the various levels as the workings were deepened and has proved of great convenience in pumping, haulage, ventilation, etc.

The four square mile area of the General Mining Association already referred to, interfered very seriously with the extension of the workings of the Springhill coal company, and in 1879 an arrangement was made for the transfer of the area to the Springhill company. This marks the commencement of the priority of the Springhill mines Owing to their access to the main line of railway, and to a shipping point at Parrsboro, their output began steadily to increase. This was assisted by the discovery that they had two seams instead of one. It will be seen that the completion of the Joggins Railway was followed by a rapid development of the colliery, but it was handicapped by having only one seam, and by the earlier access its rival had gained to all points served by the railway. The output of the county was 90 671 tons, in 1879 against 104,869 tons in 1878, which was partly accounted for by a strike of five weeks at the Springhill mines. The Chignecto mine had been worked for a number of years for local sales by Col. Bennett, who in 1881 transferred it to Messrs McInnis and Gillespie, of Montreal, on behalf of the Londonderry Iron Company. This transfer was followed by the deepening of the slope, and the erection of the usual colliery plant, and the re-equipment of the branch line to Maccan. The year 1881 saw the winnings of the North Seam, at Springhill, under way, and a tunnel being driven to connect it with the other seams. This tunnel struck a heavy feeder of water, which gave the pumps much work for a time. The levels of the other slopes were extended into the G. M. A. area, and the workings began to assume a systematic shape.

The owners of the Styles mine lying east of the Chignecto and St. George Collieries about this time traced their seams some distance further east. There seems to be an improvement in the size and number of the seams as they are followed in this direction. A good deal of work has been done in this section, and it is to be hoped either that the northern outcrop may be traced much further east than has ever been anticipated, or that the turn of the measures connecting with the Springhill basin may be met. From a theoretical standpoint the importance of tracing out a connection between the Styles and Chase's Lake Coal and that of Springhill consists in the establishment thereby of the fact that the coal measures are not in isolated basins, but form a coal field continuous under very many square miles from Springhill Junction through Athol and Upper Hebert River to the Bay-shore.

This not only increases the value of the coal areas on the northern side of the basin, but assures greater extension to the Springhill seams, and points to the possibility of accessible deposits in the more central parts of the basin.

During the year 1882 the Chignecto mine produced 12,504 tons. The Joggins company sank a slope at the face of the workings, and ran the coal to the brow of the cliff above the water by a gravity plane. The Minudie mine was re-equipped, a road laid to the River Hebert, and a small output achieved. The Springhill mines worked steadily and the north seam openings began to assume shape, the total output of the mines being 200,353 tons against 160,485 in 1881. The three slopes were considered unequal to the trade demand, and a slope known as the Syndicate was started in what was considered to be the western extension of one of the underlying seams. It was pointed out that it was in all probability the north seam. The slope proved to be on that seam. It not only proved to be of no commercial value, but became an occasion of heavy expense. A fire broke out in it, from a source never clearly explained, but attributed to the ignition of hay in the stables. After some trouble in the erection of dams the fire was put out, and the principal use it served was that of a traveling road.

The Chignecto mine reached an output of 23,395 tons and began to decline. It has been stated that this mine was purchased as a source of fuel supply to the Londonderry mines, which had hitherto been dependent on the Pictou Mines. Be this as it may, about this time the Springhill mines slack being found adapted for coke making, became a source of supply for the Londonderry mines.

It is probable that the Chignecto coal which undoubtedly yielded good coke was not subjected to a proper cleaning. The importance of this preparation of coal for coking has been well shown in the washing plant at Ferrona, in Pictou County. Here coals containing from 17 to 25 per cent ash, and 2½ to 3 per cent sulphur, have these ingredients reduced to 10 per cent ash and 1.35 per cent of sulphur.

At Salt Springs, about 3 miles east of Springhill, a colliery was opened on a small seam of coal, of good quality. However, operations were stopped not long after by the burning of the engine house. In 1885 the output at Springhill reached 335,055 tons, and arrangements were made for extending the Parrsboro Railway from the village to a more convenient shipping place near the mouth of the River. It may be mentioned here that an important change in the ownership of the Springhill mines took place in 1884, when they were purchased from the St. John company by some wealthy Montreal capitalists who organized themselves under the name of the Cumberland Railway and Coal Co.

The Chignecto mine was now practically closed. The Joggins railway, already referred to, having secured subsidies from the Provincial and Dominion Governments, was commenced and actively pushed. It was practically completed in 1887. This year found the output of the county to be 466,223 tons, and the tonnage shipped at Parrsboro amounted to 41,387 tons.

The completion of the Joggins Railway led to another renewal of interest in the small mines on the northern side of the basin They however were unable to compete with their older and more favorably situated competitors, Springhill and the Joggins. In this brief sketch it may appear that they have received brief notice, but as I am giving a brief outline of the progress of coal mining in this county, any detailed notice would unduly extend my limits. These seams altho small are of good quality and with slightly increased prices would undoubtedly find favor for steam and domestic purposes for which they have always had a good local reputation.

During the year 1888 the Aberdeen slope was started on the north eastern edge of the basin by the Springhill Company and ultimately sunk to a depth of 1200 feet on the east slope seam. The lower levels of this seam are now being extended at a depth 2300 feet to win the coal proved by this slope. The company will when this winning is completed have a large tract containing enough coal to supply their output for a number of years. In 1890 the Springhill output was 419,012 tons, and that of the Joggins 60,876. The operations at Springhill were carried on steadily, and the sinking of the slopes and the pumping operations were facilitated by bore holes for rope haulage, and supplying steam. The policy at these mines had hitherto been to connect all the seams by tunnels. It was now decided to build off all connections between the north and the underlying seams. It was found useless to adopt this policy in the case of the east and west slope seams as owing to their contiguity falls of roof in the lowest seam had established numerous communications between them. The wisdom of this policy was seen later on. For some time the seams at Springhill when they thinned had been worked on a modified long wall system. The Joggins mines about this time adopted the long wall system which was continued for some time.

The year 1891 will ever be remembered for the explosion at Springhill on Feb. 21st which caused the death of 125 men and boys. The report of the Department of Mines for that year gives the evidence taken and the report on the causes of the accident. It was a source of satisfaction to the company and the public to learn that the mine had been worked carefully and in compliance with the best mining practice. As the explosion was not followed by a fire, work was resumed without much delay. The output of the company was 450,395 tons. The works of this mine have since been carried on without blasting the coal, and safety lamps of the Marsaut and Muiseler types alone are allowed under ground. The output of the Joggins was 60,056 tons, and a number of improvements were introduced, effecting a reduction in the expense of conveying the coal to the wharf and of shipping it.

The next improvement at Springhill was the introduction of endless haulage on the principal levels, and the erection of a trestle to carry the coal from the north to the west bank head for screening and shipping. A powerful tugboat, and five barges, each of about 800 tons capacity, were built, and a regular system of tonnage inaugurated between Parrsboro and St. John and other ports on the Bay of Fundy, and in the New England States. This has worked very successfully and has proved a valuable adjunct to the mines.

In 1893, the output of the Joggins mines reached 70,138 tons. During this year the mine was purchased by the Canada Coals and Railway Company, with Montreal and New York capital.

In 1895 the production of this mine rose to 110,082 tons. At Springhill the north and west bank heads and the connecting trestle were burned down. A new bank head was built at the north slope, and the production was 381,032 tons. During the following year the Joggins output fell to 59,125 tons, due in part to a prolonged strike and to the inability of the pumps to contend with the water. The Minudie mine was re-opened and worked by Mr. Hall, formerly manager at Springhill On the 24th of December, 1806, a fire broke out in the pipe slope of the east slope, Springhill, and was not extinguished for several months. The west slope was now reequipped with a bank head, and the east slope abandoned. The output of the Joggins in 1807 was 73,357 tons and that of Springhill 318,296 tons. The system of longwall in the Joggins mines which had been discontinued for some time was recommenced.

From this sketch it will be seen that practically speaking the history of the coal trade of Cumberland county is the tale of the Joggins and Springhill mines, and that these collieries are able to meet the demands of the trade. The remaining mines altho containing valuable seams seem destined to await a further extension of trade before they will be brought into operation.

The Joggins mine has, so far as known publicly, only one seam yielding about six feet of coal. It has been worked with much energy, but is necessarily handicapped by this fact, as it cannot raise as much coal a day as Springhill can from its three seams.

At Springhill the slopes have reached a depth of 3200 feet and are several years in advance of the requirements of a development advancing with the extraction of coal. The level, now advancing toward the Aberdeen slope, will, when completed next year be 1200 feet below the foot of the 1200 feet level of the Aberdeen slope and have a lift half a mile wide and of unknown length of untouched coal, enough to keep the colliery going for years to come. In all the seams the levels are advancing beyond the immediate needs of the mine, so that under ordinary circumstances within a short time these mines should be prepared to stop development work for some years.

The earlier system of workings at Springhill did not contemplate the entire removal of pillars. It was found that their retention in the mine increased the difficulties of ventilation and kept the surface broken for the admission of water etc. It was decided some years ago to practically sweep them all out of the upper levels and to take them out systematically in the current workings. This has been effected in the thinner divisions of the seams by longwall and in the thicker seams by working back and drawing the pillars as the bords in each balance were completed. The result of this has been the consolidation of the overlying strata so that the pressure on the lower workings has been reduced, and much less water finds its way into the mine At present the very effective set of Jeanesville pumps used in draining the mine have comparatively little work to do. These pumps are driven by steam, and the pipes are slung by chains from iron booms so that they do not touch any timber, and can be readily inspected, etc.

The presence of coal seams below these worked at

Springhill has long been known in a general way. A few years ago the company commenced their systematic exploration with the following results On a horizontal line of about 26 chains, measured in a south western direction from the outcrop of the west seam the following outcrops have been proved:—

	ft	in.
Coal	3	4
"	4	3
"	5	6
"	2	8
"	1	6
"	7	6
"	2	0
"	4	8
"	5	0
"	7	0
"	2	4

As a number of these seams were of good quality the company decided to ascertain if they followed the rule observed in the three seams being worked, viz, an improvement in size and quality as they were followed down from the surface. A tunnel was started into the underlying seams from the 2300 feet level of the west slope. At ninety feet a seam known above as of insignificant size was intersected giving:—

	ft.	in
Coal......................	0	6
Shale coal	0	10
Coal	3	1

This coal is of excellent quality running 3.30 per cent only in ash. Its quality as well as its increase in thickness are very encouraging auguries as to the quality and size of the seams to be met as the tunnel is extended.

During the past season Mr. Fletcher, of the Can. Geo. Survey, assisted by Mr. Whitfield McCarthy, the well known prospector, who tested the seams just referred to, has traced the worked seams a long distance to the south west of Springhill, and there is apparently in the Maccan Valley a basin equal to that now being worked to the northwest of Springhill. These discoveries are very important, as they assure to the company an apparently limitless supply of coal, and inspire confidence in the future, not only of the town of Springhill, but of all interests depending on the extraction and transportation of coal in Cumberland county.

OUTPUT OF COAL FROM CUMBERLAND CO., IN LONG TONS (2240 lbs) FROM 1863 TO 1897.

Year.	County.	Joggins.	Springhill.
1863	13,856	4,648	
1864	10,642	4,995	
1865	11,400	5,430	
1866	17.900	10,250	
1867	8,640	7,810	
1868	15,125	12,500	
1869	15,000	13,000	
1870	9.480	8,025	
1871	11,432	10,985	
1872	15.753	12,983	1,450
1873	27,592	19,326	6,704
1874	51,480	16,685	33,127
1875	64,689	11,908	50,505
1876	93,232	14,296	72,596
1877	117,044	10,223	93,606
1878	113,873	11,896	100,621
1879	99,222	9,061	88,405
1880	143,085	13,350	127,907
1881	183,469	18,880	160,485
1882	233,084	20,178	200,253
1883	247,761	26,098	193,161
1884	279,746	25,034	232,481
1885	369,023	17,664	335,005
1886	448,621	22,243	416.769
1887	499,472	16,649	466,223
1888	470,833	48,448	406,195
1889	490,432	45,411	425,149
1890	490,149	60,876	419,012
1891	522,078	60,056	459,395
1892	478,493	63,505	392,724
1893	403,482	70,138	333,009
1894	543,831	91,810	448,728
1895	495,369	110,082	381,032
1896	476,037	59,125	411,320
1897	392,973	73,357	318,296

—APPENDIX B.—

COAL MINING IN PICTOU CO.

Coal mining in Pictou Co. is too large a theme to be treated, even in the most condensed form, in a few pages, to do anything like justice to the subject. In connection with the discovery and development of the coal mines of Pictou Co. there are more incidents, interesting, remarkable and thrilling than in connection with the opening up and carrying on of coal mines in any part of the province, if it may not be said of the American continent. For a period of some sixty years or from about 1830 until 1888, the mining of coal in Pictou County was attended by so many difficulties that it is cause for wonder that the field was not at times abandoned. It may be said of Pictou Co. that it is the only county in the Province possessing pits which the operators on account of accidents were forced to abandon. On account of the many fires and explosions, coal mining in Pictou Co. has not been so profitable an investment as in Cumberland and Cape Breton, though even in these counties the operators have declared frequently that there was no money in coal mining. Be that as it may there are operators, some retired, some still in harness, who cannot be classed among the poor and needy. The Hon. Mr. Cunard stated in 1850, in the course of some remarks, that for eighteen years the General Mining Association had worked its mines without realizing a dividend for its shareholders. If the statement is correct then heavy losses must have been sustained in other sections of the Association's field of operations, as the mines in Pictou Co. during the period of 1841 to 1851 showed to their credit the fair sum of $693,000. Taking the total sales for that period of time as 1,250,000 tons the profit would be close on sixty cents per ton. In these days that would be considered a handsome profit though it might have been lightly looked at fifty years ago. The name of the discoverer of coal in Pictou Co. and the manner of its discovery must be left to be told by the writer of a more extensive history. Coal is said to have been discovered in 1798, in the Albion district The first coal fire in a house in the County is credited to Dr. McGregor—in 1799.

In the year 1807, John McKay, known as Collier, obtained a license to dig coal for the inhabitants,and at a later day to export. McKay and his father discovered what is now known as the big seam. John McKay worked at this for a time, selling the coal at the pit's mouth and shipping it in lighters down the river. In 1815 650 chaldrons were exported to Halifax, the price there having risen owing to the war. After the peace, the price fell greatly and McKay failed.

In 1818, leases were granted to Edward Mortimer. He had two, one on the east side of East River on which a rental of £110 was payable; the second on the west side of East River the rental on which was £260, besides 3 s. on every chaldron over 400 per year. Mortimer died shortly after his acquisition of the leases, and these, which ran for a period of 25 years, were transferred early in November 1819 to George Smith and Wm. Liddel. These gentlemen claimed in 1831 that their rights were infringed on, by the lease of all the minerals in Nova Scotia to the Duke of York,—July 1826,-and petitioned the government for redress. Their claim was for some five thousand pounds, which it is presumed they did not receive. In 1826 Smith claimed to be making a profit of £200 on his sales.

There is no accurate record of sales previous to 1815. In that year 1934 tons are given as having been sold. And it is no easy matter to give the quantity mined and sold from 1818 to 1827. One return places it at about 23,000 tons, another at 27,000 and a third at double the latter figures. Messrs Smith and Liddell gave their sales as follows, in chaldrons,—as in first column—while another return gives a larger quantity in tons—as in second column :

1818 —	3,030	Chaldrons	8,000	tons.
9	3,081	"		
1820	2,610	"	7,762	"

1	1,370	"	4,081	"
2	2,049	"	5,970	"
3	1,725	"	5,140	"
4	2,261	"	6,737	"
5	2,801	"	8,345	"
6	2,901	"	7,517	"
7	2,523	"		

In 1827 the General Mining Association of London took hold, obtaining their title through Messrs Rundell, Bridge and Rundell, Jewellers, who were large creditors of the Duke of York. During the summer of this year the G. M. A. sent out Mr. Richard Smith to commence operations. In June a vessel arrived in Pictou with men, machinery and supplies. Having secured Adam Carr's lease and having purchased the farms of Dr. McGregor, William McKay and Colin McKay, Mr. Smith put up machinery, began sinking pits, and made arrangements generally for conducting operations on a large scale, and after the most economical and approved methods of the day. The Store pits, or as they were afterwards known the Burnt mines were sunk. The depth of these, according to Dr. Patterson, was 212 feet, but another account gives the depth of the deepest at 240 feet. Early in September the first coal was raised from the mine, and in December a steam engine was in operation, the first erected in the province. From 1828 to 1834,—the coal was put into scows, first at a point above present railway iron bridge, and then at a point near the old cemetery, below the bridge. In Dec. 1834 a wharf was built a little below New Glasgow on the opposite shore. The coal was hauled from the mines to the wharf by horses on a connecting railway. Vessels of light draught only could be loaded at this wharf as there was little depth of water in the river. In 1830 a tug boat was launched at Fisher's Grant for towing on the river. In 1834 plans and surveys of a railway to the Loading Ground were made, and operations began. This road was completed in 1839 and was the first on which a locomotive ran in British America.

In 1832 the Store pits took fire and had to be flooded. Between that year and 1839, the pit fired frequently, and in 1839 so serious a fire broke out that it had to be abandoned and flooded for the third time.

The Bye pits—afterwards known as the crushed pits—were sunk in 1839. The Dalhousie pit was sunk in 1850, the Cage pit in 1852, the Foster pit in 1866, and the Foord pit in 1867.

There were several fires in the Bye pits, and they had finally to be abandoned in 1863. The Foster pit was found to be on fire in 1869. As the coal was found to be inferior no serious effort was made to recover the pit and it was abandoned. On account of a heavy crush the Dalhousie pit was abandoned in 1872 In 1880 occurred the great explosion in the Foord pit, in which 53 lives were lost The explosion connected through a stone tunnel to the Cage pit. Fire having followed the explosion both pits were abandoned. The cause of the explosion was never ascertained, and the bodies of the victims have not been recovered.

In 1881 two slopes were driven in the 'Third' seam and a shaft sunk on the McGregor seam, about a mile westerly from the Foord pit. In 1888 there was an explosion in the Third pit seam, luckily unattended by loss of life. There are positive opinions held as to the origin of the fire, one set at variance with the other. The popular opinion is that it connected from the Cage pit, by a fall. One of the two slopes in the 'Third' seam —the one in which the fire originated—was walled off, and that side of the pit abandoned. It will be gathered from the foregoing short statement of abandonment of mines, that the history of the Albion Mines from the year 1832 till 1888, has been a record of explosions and fires.

Notwithstanding the many obstacles, to an extensive trade continually being encountered, the shipments of coal, in the fifties, and, more particularly, the sixties reached large proportions. Indeed in these years the Albion easily took first place. In 1863 no less a quantity than 198,313 tons were sold and shipped, in nine months of 1864 159,296; in 1865, 201,334; 1866, 194,301 and in 1867, 120,000 tons. From these figures for the four years following there was a marked decline, the shipments of 1871 having fallen to 77,133 tons. During the years when the Albion was at its best the shipments were chiefly to the United States. The coal was extensively used in the iron works in the New England States. With the shutting down of the iron works there the demand ceased, and prices lowered to $3.50 a ton.

In the year 1872 all the rights and interests of the General Mining Association, in Pictou County were acquired by a new company called the Halifax Company, of which Sir George Elliot was president. In this year some of the ground lost in the years preceding was recovered, and the production of the mines increased to 107,000 tons. From that time on production kept increasing till 1879, when it reached 170,000 tons. Owing to the explosion in the Foord pit, previously referred to, the production fell in 1881 to 59,316, but in the year following it had mounted up again to 141,000 tons, and in 1883 it reached 168,000 tons, In no year since has the production been so large.

In 1886 the Halifax Company entered the 'Amalgamation' as it is popularly called. The amalgamation included the Acadia, Halifax and Vale companies. The reason given for this amalgamation was that the several collieries could be more economically worked under one management than under three. When the amalgamation was completed, Mr. H. S. Poole, of the Acadia Co., assumed the chief position, which he has since held. After the amalgamation the output of the collieries declined, as much probably from a general lessened demand, as from the removal of competition, which, while the companies were rivals, may have acted as an incentive. The new concern assumed the name of the Acadia Coal Co. Ltd. In 1888 the production from the mines of the new Acadia Company reached its highest, when the figures stood 290.000. Since 1889 to 1898 the production has oscillated between 280.000 and 198.000 tons.

In 1898 Mr. H. Montagu Allan, of Montreal, succeeded Mr. Clendennin, of New York, after the latter's death, as president of the company. Owing to Mr. Allan's extensive business connections, and to the fact that he is a resident of Canada, the opinion is expressed that from this out, the trade of the company is likely to increase. For many years previous to '98, little or none of the Acadia Co'y's coal found its way into the province of Quebec. One reason given was that the state of the mine,—its limited capacity,—did not warrant contracts being entered into. That reason is now removed, as at the present time, as the result of years of patient, persistent, endeavor—a large area of coal has been opened out, under the direction of Mr. H. S. Poole, in the McGregor seam. This large block of coal, ready to be won when the demand arises, is in extent 2000 ft by 4000 ft and is estimated to contain between two and three million tons of coal.

THE ACADIA COAL CO'Y, 1865.

On the expiration of the monopoly of the General Mining Association in 1856, active prospecting for minerals, chiefly coal, began, One of the most energetic explorers was Mr. J. B. D. Fraser, of Pictou, who took out rights of search to the south and west of the four square miles retained by the General Mining Association around the Albion Mines. Mr. Fraser failed in locating any large seam below the McGregor which he worked, but discovered what is now known as the Stellar coal seam. This coal, with its shales is rich in oil. Two slopes, one 215, and the second 210 feet were driven in the seam. Shipments were made to the United States, for a year or two, where oil of excellent quality and in large quantity was distilled from the coal, but about this time the frequent discoveries of oil wells in the U. S. and Canada, led to so great a reduction in the price of oil that shipments became unprofitable and the works were closed. Some day this seam may become valuable.

Mr. Fraser was instrumental, in 1865, in organizing the Acadia Coal Co'y, composed mainly of New York people. This company commenced working the McGregor seam, at the place originally worked by Dr. McGregor. Numerous buildings were erected, including dwellings, and a large machine shop. The necessary plant was provided for the establishment of a large colliery, but very little in the way of development was done, as at this time an excellent seam of coal had been discovered about two miles west of the Albion seams. An American, named French, takes credit as the discover of this seam. Dr. Patterson, however in his History of Pictou Co. is of opinion that the honor of the discovery belongs to Mr, James Fraser, of Mount William. Mr. John Campbell traced the seam a mile or more to the south of the place where it was first discovered. These seams at Westville are regarded by some geologists as a continuation of the seams on the East River. If so they have changed greatly. The Acadia Company in 1867 began operations on their westward seam and constructed a railway three miles long, connecting the mine with the government railway, over which the coal was carried to the company's wharves at Fishers Grant, on the mouth of Pictou Harbor. The Acadia Colliery, since its first start, has worked uninterruptedly, having met with no serious mishap. The output from the mine has been steady, if not as large as some of the other collieries. About a hundred thousand tons is the outside limit of production in any one year. The pit has now reached a great depth, the main slope having been driven a distance of over 5000 feet, with a vertical depth of 900 feet.

THE INTERCOLONIAL MINING COY.

Mr. Campbell, previously referred to as having traced the seam southerly, sold an area which he had secured, and on which he had sunk a small shaft, to the Intercolonial Mining Company, composed of Montreal men of which Mr. Geo. A. Drummond was president. The company soon after acquiring the area commenced work. Two slopes were sunk in 1868, in the large or main seam, which goes by the name of the Acadia seam, and in that year about 14,000 tons of coal were raised. Wharves had been built at Granton, Middle River, provided with several chutes, and facilities for large shipments. A railway seven miles long connecting the works with the wharves, was opened in Oct. Owing to the lateness of the season and the fact that the road was imperfectly ballasted, only a couple of thousand tons were shipped. At a later date a second and shorter railway was built, connecting the mine with the government railway at a point a mile south of the present Stellarton station. When the government set about building the short line, to run from Stellarton to Oxford, it acquired possession of the Acadia Company's branch between Stellarton and Westville, since which time the coals from the Acadia and Drummond Collieries, for points on the I. C. R., have been carried by the government, and thus rendering the short line of the Intercolonial Coal Company useless, leading to its abandonment.

In 1869 the colliery under Mr. Dunn's management was in a thorough state of efficiency, and ready for large shipments. The slopes had been driven in the coal a distance of 900 feet, with levels driven from each side 300 feet In 1872 with a brisk demand came an opportunity to test the capacity of the colliery. In that year the shipments reached 102,000 tons.

In anticipation of continued brisk demand for coal great preparations were made in the beginning of 1873 for increased shipments The main slopes were driven an additional 200 feet providing a fourth lift. Many tons of coal were stowed in the rise workings of the pit. There was a large quantity of coal banked, and when the spring trade opened the prospects for shipments never had looked so promising. Shipments had began in earnest when a strike of the miners took place, throwing the pit idle. After being idle a week or so operations recommenced on the 13th May. About noon on that day a shot fired in a lower level on the south side in a place known as "McLeod's" set fire to gas issuing from the coal, which in turn set fire to the coal. All efforts to quench the fire were unavailing. When it was seen that the fire was gaining ground, orders were given that all men who were disinclined to assist in an attempt to save the mine should leave the pit. The boys had previously left with the exception of one, and of the men all but about a dozen who remained with Richardson made for the surface. Richardson and his men may have remained to put up stoppings, but this they never did for before the men who had already left had gone far up the slope a terrific explosion occurred which for violence was beyond description, dealing death and destruction on all sides. The first great explosion was followed by others also violent, and the temporary destruction of the mine was complete. The mine was flooded with water. In 1875 the old slopes had been recovered and a new one sunk.

To day the Drummod Colliery is one of the most thoroughly equipped mines, whether as regards machinery for hoisting and cleaning coal, or for pumping and ventilation, of any in Nova Scotia On the retirement, in Oct. 1887, of Mr. Robt. Simpson, who had succeeded Mr. Dunn in 1873 in the management, Mr. Chas. Fergie of Wigan, took charge. Under Mr. Fergie's management the business of the colliery has largely increased, and the financial position of the company has improved.

The following condensed section, from Geological Survey Report, will show the position of the seams in the Albion district :

	ft.	in.	ft	in.
Strata.................			1126	0
Main Seam	34	7		
Strata.................			143	
Deep or Cage Pit Seams	22	11		
Strata....			106	
Third Seam............	5	7		

Strata.................			113
Purvis Seam	2	6	
Strata.			130
Fleming Seam	3	2	
Strata.................			4
McGregor Seam.......	11	7	
Strata.......................			211
Stellar Coal.............	5	0	

The following section gives the position of the seams lying to the west of the Albion seams, at Westville :

Main Seam..	17 ft.	Westville Section.
Measures...........	184 "	
Scott Pit Seam.......	12 ft.	
Measures..............	107 "	
Third Seam..........	6 ft.	
Measures.....	90 "	
Fourth Seam.........	8 ft	

In the Vale area, of three square miles, two seams have been worked presenting the same general features, and the following section :

	feet	feet
Strata,		
Six feet seam,	3 to 6	
Strata,		700
McBean seam,	6 to 7	

OTHER OPERATIONS.

From Dr. Patterson's history of Pictou Co. we extract the following as a fair summary of operations conducted on a smaller scale than those already referred to:

"Mr. French, who had obtained the lease of an area of three and a half square miles, where the extension of the seams in this direction (to the westward of the Albion seams) was first discovered, worked for a time spending money uselessly, but his rights were transferred to a company, composed of persons principally resident in New Haven, Connecticut. In 1869 they commenced building a railway from their mine to the Middle River a distance of six miles ; and in July 1871 they had it completed with shipping wharf, and commenced shipping coal. On this railroad the most notable feature is the high bridge across McCulloch's Brook. It is a trestle built of Southern pine, imported for the purpose. It is 400 feet long consisting of 4 spans of 100 feet each. The middle span is 78 feet above the bed of the brook.

The works of these three collieries (Drummond, Acadia and Black Diamond) being in immediate proximity, a village has sprung up named Westville, of which the growth has been more rapid, than that of any place known to me in these provinces. . . . . In 1875 a census was taken when the village was found to contain a population of 2,500 . . . Another company, known as the Montreal Company, established by Mr. Robert G. Halliburton, sunk a shaft just opposite New Glasgow, on an area owned by them, which thus lies at the north side of the coal field, and near the base of the conglomerate. Here they found the coal of good quality, but lying at a very steep angle, and abounding in imflammable gas. But nothing has since been done to develop the property.

Before the commencement of the General Mining Association's operations, a seam was opened on the east side of the river, and after the abolition of the Mining Company's operations (monopoly), it was again opened by the Pictou Mining Coy. The coal was found to be inferior in quality and a continuation of the deterioration having been ascertained by a shaft sunk further to the east, all operations were abandoned, though Mr. Rutherford expresses his opinion, that it may not continue far into the dip.

Considerable labor and means have been expended in endeavors to trace the course of the seams further east. The result has been the discovery of several beds of coal; but the field, on examination, has been found so intricate, the measures so disturbed and broken that their extent and position, as well as their relation to the other seams, are as yet involved in some uncertainty. . .

Immediately behind New Glasgow two seams have been opened, the lower known as the Stewart seam, upwards of three feet in thickness, and the upper as the Richardson, 2 feet 9 inches, both of which are regarded geologically as overlaying the main seam.

About a mile further east two seams have been discovered, about 3½ and 4½ feet thick, and another larger. But. . . . the whole measures are so broken that very little has been done in the way of mining upon them.

Further east at what was known as the Marsh four young men named McBeans took out rights to search. They were at the time possessed of but limited means but they spent time and labor and what means they had, in exploring their area, and in opening some veins found upon it. Their enterprise in due time met with its reward. The examination of the field by Sir William Logan, proved that their lease covered valuable seams of considerable extent. It was accordingly purchased by a Company in Montreal, known as the "Vale Coal Iron and Manufacturing Company," of which Sir Hugh Allan was president. . . . . The colliery is situated about six miles to the eastward of New Glasgow, on a seam formerly known as the McBean area. . . . . A railroad six miles long, leading from the colliery and joining the intercolonial at New Glasgow, with all the necessary sidings. has been constructed by the company. The works of the Vale colliery were started in the woods in the fall of 1872. A few trains were run over the railroad to Halifax in the fall and winter of 1873-4 and in 1874 the output of merchantable coal was 39,000 tons."

In addition to what Dr. Patterson has written regarding the Vale colliery it may be stated, that the colliery reached its maximun output in '86 when the sales were 121,000. In 1886 the Vale Company entered the amalgamation. In Dec. 1889 a fire occurred in the McBean pit which rendered necessary the flooding of the mine. Since that time the pit has remained closed. After the abandonment of the McBean seam operations were transferred to the six foot seam, so called. The coal in this seam is not so easily mined as in the McBean, and the output from the colliery during the past few years has been limited. There are comparatively few men at the Vale now compared with the number twelve years ago. Many of the buildings are falling into disuse, and it is unlikely the Vale will soon again present the busy appearance of former years.

APPENDIX C.

MINERAL ORES OF NOVA SCOTIA.

The Province of Nova Scotia in proportion to its extent has most abundantly, can it not be said lavishly been furnished by nature with minerals of almost every description. The variety and extent of her ores are only, it may be said, beginning to be known. Of late years there have been discoveries of minerals, of value, which formerly were not thought of as existing in the province. And it is confidently believed as time goes on that further discoveries of new minerals will be made.

Below are given the names of the minerals discovered to date and the principal localities in which they may be found.

COAL.

Varieties.—Bituminous coal, Cannel, Oil coal, Oil Shale, Petroleum, Peat.

Bituminous coal:—Three principal districts, Sydney, Pictou and Cumberland. The amount in the Sydney and Cumberland districts is practically unlimited The area of the Pictou coal field is defined with some degree of accuracy, and is known to contain many years supply at the present rate of production.

The area of the Sydney coal field is about 400 square miles; that of Pictou about 30 square miles and that of Cumberland about 300 square miles.

The remaining districts are as follows:—Inverness County,—Chimney Corner, area about 100 square miles; Broad Cove, area about 30 square miles; Mabou, about 20 square miles.

Coal occurs at Pomquet, Antigonish County; between New Glasgow and Pictou, and at River John in Pictou County. Also along the Southern flank of the Cobequid Mountains, and in the district extending from Stewiacke to the mouth of the Avon River. In all these localities the beds hitherto found are small and their extent has not yet been defined with enough exactness to permit of any estimate of their extent and value.

There is also in this County a small coal field at Glendale on the River Inhabitants, as yet but partly explored. Its area has been put down at 5 square miles. At the mouth of the River Inhabitants there is an extensive coal field, which has not yet had its boundaries defined. So far as can be learned at present its area should not be less than 100 square miles.

CANNEL COAL.

Beds of Cannel coal are reported from several points in the Sydney coal field, but are, so far as hitherto observed, too thin for profitable working. At Hallowell Grant, Antigonish County, Cannel coal occurs of good quality and extending over a considerable extent of ground. A two foot seam of excellent looking Cannel coal is shown a mile or two distant from McIssac's pond, Broad Cove. Mr. Madden, formerly deputy Inspector, and other experts who have inspected the seam, speak highly of its quality. It is thought that the seam could be worked to advantage in connection with other coal seams in the vicinity.

A bed of oil coal known as Stellar coal, was extensively worked at Stellarton, Pictou County. A considable amount is still available.

OIL SHALE.

Beds of large extent are met in Pictou County overlying the main seam. Also at Hallowell Grant, Antigonish County. Deposits from 3 to 12 feet in thickness occur over a large extent of ground at MacAdam's Lake, Cape Breton County.

PETROLEUM.

Traces of petroleum occur at Cheverie near Windsor, Hants Co.; and at Lake Ainslie, Inverness County. Some work has been done searching for the deposits, but as yet no estimate can be formed of the profitable extent of the oil.

BITUMEN.

Solid Bitumen occurs in small quantities at various localities, in limestones, gypsums, etc.

PEAT.

Extensive deposits of Peat are found at many places along the Atlantic coast, and in some of the larger western bogs Also in Victoria and Inverness Counties

GOLD.

Gold occurs in Nova Scotia as "free" or visible gold in quartz veins, etc; also connected with the metallic sulphides etc. The territory occupied by the auriferous strata stretches from Canso to Yarmouth in Nova Scotia proper, and covers an area estimated at over 3,000 square miles. In Cape Breton, in the northern part of the Island, there are also large tracts of auriferous ground hitherto little prospected; and recent discoveries indicate that the Cobequid Mountains in Cumberland County, are also auriferous in places. Among the localities yielding gold may be mentioned Wine Harbor, Stormont, Sherbrooke, Fifteen Mile Stream, Killag, Beaver Dam, Tangier, Chezzetcook, Lawrencetown, Montague, Cow Bay, Waverley, Oldham, Renfrew, Caribou, Moose River, Rawdon, Brookfield, Malaga, Caledonia, Kemptville, Cream Pot, Gold River, Leipsigate, Liscomb, etc, etc.

SILVER.

Native Silver has been reported from McKenzie River, Inverness County. It also occurs in small amounts in the free gold in the auriferous quartz veins. The proportion is sometimes large enough to warrant its being returned separately for royalty

It is also known to occur in the Tennycape manganese, and in the native copper of the Bay of Fundy, Watchabucht, North River, St. Ann's Barasois, Burnt and Boulaceet Harbors, Salmon River road, Port Hood, Arichat, in Cape Breton;and Caledonia, Guysboro Co., Musquodoboit, Gay's River, Pembroke, Smithfield, Springville, West River, may be mentioned as localities yielding silver in connection with lead, copper ores, etc. At some of these localities decided values have been shown in the ores, but little or no work has been done.

On the Cheticamp River, Inverness County, a silver lead mine is being opened up. There appears to be a large amount of ore carrying lead and silver in remunerative quantities. Other deposits are known in this locality but have not yet received attention.

MINERAL ORES OF NOVA SCOTIA.

ANTIMONY.

This mineral in the form of Sulphide, carrying small amounts of gold, was mined for a number of years at Rawdon, in Hants County There are indications of other deposits in this vicinity.

MERCURY.

This metal is reported from a number of places in the province, French River, Dartmouth, Chegogin, Gay's River, Waverley, but the extent of the deposits is considered of doubtful value.

MOLYBDENUM.

This metal occurs frequently combined with sulphur, as Molybdenite. It is known at Gabarus, Louisburg, in Cape Breton,and at Hammonds Plains, Lower Musquodoboit, Chester, New Ross, etc. A few barrels of the ore have been shipped from Gabarus. As yet, however, no deposits have been noticed large enough to permit of mining operations.

TUNGSTEN.

Tungstate of iron occurs in a vein 3 to 6 feet wide at Margaree, Inverness County. It is stated to occur in quantity, and is being opened up. The ore of this mineral is used as an alloy in hardening steel, and brings a high price in the market.

ARSENIC.

The most common ore of this mineral is a compound of iron, sulphur and arsenic known as Mispickel. It occurs in some abundance in many of the auriferous quartz veins of the Atlantic coast. Should any increase arise in the demand for arsenic this source could be drawn upon for considerable supplies.

COBALT AND NICKEL.

These metals are frequently found in Nova Scotia, but as yet the percentages noted are too small to permit of economic exportation. Among the localities yielding it may be mentioned Montagu, Mount Uniacke, Newport, Nictaux, Geyser's Hill, Carribou, Louisburg, etc.

BISMUTH.

This metal has been found native near the mouth of Pugwash River, and at Wagamatcook, in small water worn masses. Nothing however is known of the source or extent of the specimens.

MINERAL ORES OF NOVA SCOTIA.

COPPER.

This metal occurs native in small nodules and stringers in the trappean rocks of the Bay of Fundy, and at Polson's Lake, Antigonish County. Explorations have hitherto failed to disclose these deposits of native copper in amounts of economic. value.

COPPER PYRITES.

This ore occurs at Polson's Lake, Lochaber, St. Joseph, Grant's Brook, and Brierly Brook, Antigonish County. It is considered that the work done at the first named two places indicate deposits of considerable extent. Other places are known to contain copper ores, viz. Cheticamp; Crysocolla, and green carbonates, indications wide spread. East River, Pictou County, near Hopewell, Sulphurate and Carbonate in sandstone —extent not considered important. Indian Point, Five Islands, red oxide; with gray ore and carbonate, vein small. Other localities yielding gray copper ores are Salmon River, Guysboro Co., Caribou River, Durham, French, Waughs and Wallace Rivers. Copper pyrites occurs at Margaretville, Sleep Mountain, Inverness Co., Blandford Cove, Brookfield, Westfield, Jebogue Point, East Dalhousie. In Cape Breton County extensive developments have been made at Coxheath, in leases of iron and Copper pyrites in felsites. The amount of ore is apparently very large and of good quality. Other deposits of a promising character are known at George's River, Gillis Lake Road. Louisburg Road and Gabarus.

ZINC ORE.

The sulphuret of zinc, zinc blende, is frequently found in the auriferous quartz veins in small amounts. At Cheticamp it occurs in considerable amounts associated with lead ore.

GRAPITE, ETC.

This mineral is frequently met as a plumbaginous shale. Among localities yielding it may be mentioned Parrsboro ; Salmon River, Colchester Co., Musquodoboit; Grand Narrows, Gillis Lake, Cape Breton County and River Denys and Glendale, and a 2½ feet bed at Whycogomah, Inverness County. A number of the deposits are extensive and in some cases practical tests are said to have shown its adaptability for economic uses.

MINERAL ORES OF NOVA SCOTIA.

SULPHUR.

Apart from its occurrence as a constituent of various minerals forming larger or smaller percentages of gold veins, etc, sulphur, combined with iron to form iron pyrites and pure enough to form an ore of marketable value, is rare in the Province. A bed on the upper waters of George's River, Cape Breton County is the only deposit at present known.

IRON ORE.

Bog Ores.—These occur in beds in almost every part of the Province. Among the larger deposits may be mentioned those of Schooner Pond, Cape Breton County, Merigomish and Middleton. The ore of the first named place gives over 52 percent of metallic iron, with only traces of sulphur and phosphorus.

CLAY IRON.

This ore occurs frequently in the coal measures but has seldom been observed in amounts of any value. Large bodies occur on the French River, Pictou County. Under this head may be mentioned Spathic ore which occurs on Boularderie Island; French River and East River, Pictou County, and at Londonderry.

LIMONITE OR BROWN HEMATITE.

This ore is found in large quantities at Bridgeville, Pictou County; at Londonderry, Clifton, The Gore, Brookfield, West Branch Lake, Green Hill, Walton, Loch Lomond and Lake Ainslie. It is also found at other points in deposits about which little is known.

SPECULAR OR RED HEMATITE.

This ore occurs in large quantity at Torbrook, Bear River and Nictaux, in Annapolis County; Upper Stewiacke, Londonderry, Springville, Sutherland's River; Arisaig; St. Peter's; Salmon River, Guysboro Co., Whycogomah, Mira, Barasois, Loch Lomond and East Bay. Among other localities may be named Barney's River, Merigomish, Milford Haven, Grand River, etc

MAGNETITE.

This ore is found at Nictaux, North Mountain, Cape St. Lawrence, Whycogomah, St. George's River, Lewis Mountain, etc. Some of the deposits are large and valuable.

TITANIFEROUS, IRON ORE.

This is reported from Sable River, Shelburne Co.

Musquodoboit and several points in Yarmouth and Digby Counties.

MINERAL PAINTS.

The ochres or porous hydrated oxides of ironand manganese may be classed under this head. They occur at Londonderry, Folly Mountain, Onslow, Chester Basin, Kentville, Louisburg, and numerous other places. The quality of some of the deposits is good, but as these ochres are abundantly distributed over the world, and sell at low figures, little has been done to utilise the provincial deposits.

MANGANESE ORES.

This ore occurs in quantity at Walton, Cheverie, Tenny Cape, in Hants County. It has also been worked in Onslow and on the Salmon River, Colchester County. Among other localities may be mentioned Fennerty's, Halifax Co., Greenwich, Kings Co., Springville, Musquodoboit, Cornwallis, Bridgewater, New Ross, Loch Lomond, Boulardrie, etc.

GYPSUM.

This mineral occurs in great abundance in the central and Eastern Counties. It is of every variety of feature, color and purity. The principal export is from Windsor and vicinity, and from quarries at Port Bevis in Cape Breton.

BARYTES

This mineral occurs at many places in the Province, Five Islands, Brookfield, River John, Clifton, Wallace River, Antigonish, Cheticamp, Loch Lomond, St. Ann's etc. It has been mined at Lake Ainslie, Brookfield, River John and Five Islands where the deposits are believed to be of great extent.

SALT.

This occurs in Nova Scotia as brine in the form of springs. They yield salt of good quality. Among the best known localities may be mentioned Renfrew, Walton, Salt Springs, Irish Mountain, Sutherland's River, Antigonish, Baddeck, Whycocomagh, etc.

MINERAL WATERS.

There are numerous mineral springs in Nova Scotia, as at Wilmot, Windsor, Chester, Salmon River, Cheticamp, Irish Mountain, Gairlock, etc.

BUILDING STONES.

The building stones of Nova Scotia are varied and of good quality. Sandstones and freestones of good quality and various shades of color abound along the Gulf shore from the Joggins to Antigonish. Syenites, porphyries and granites are abundant along the Atlantic coast, in the Cobequids, and at many places in Cape Breton. The supply of these rocks, fitted for builders purposes, is unlimited, but has, as yet, been little drawn upon.

LIMESTONE.

Limestones are very important in the interior and Eastern parts of the Province. In many places the stone is flaggy and can be quarried for masonry purposes. In places it is adapted for lime burning for building or agricultural purposes. Again it occurs metamorphosed into marble as at West Bay, Cape Breton, where it has been worked for some years.

Flags and slates are met at the Gore, Beaver Bank, etc. Brick clay abounds in the valleys and is used to some extent for brick and tile making. Fire-clay is found in the coal measures but has not yet been utilised. Kaolin, refractory stone, soapstone, felsite, etc., are reported from various points.

INFUSORIAL EARTH.

This material is found abundantly in many lakes throughout the Province. Operations are being carried on in large deposits at Bass River, Colchester County, and at St. Ann's, Victoria County.

GRINDSTONES

The upper coal measures and mill stone grit of the Counties bordering on the Gulf of St. Lawrence, frequently yield stones of good quality. Extensive quarries have been worked at the Joggins, and small lots are cut at various other points. Grindstones are also cut from granite boulders

There are in addition numerous minerals known only in small amounts associated with those referred to, and not yet known to occur in amounts possessing more than a scientific interest.

There are also a number of beautiful and rare minerals found in the trap rocks of the Bay of Fundy. The reputation of this district is world wide for these minerals which are in request by collectors, but are of little economic value.

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